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Malnutrition and Poverty in Guatemala

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Abstract

The objective of this paper is to document the extent and distribution of child and adult malnutrition in Guatemala; to analyze the relationship between selected child, maternal, household and community characteristics and children's nutritional status; and to outline the implications of the most important findings for nutritional policy.

The prevalence of chronic malnutrition among Guatemalan children in 2000 was the highest in Latin America and among the highest in the world. The data show very strong socioeconomic and geographic inequality. The econometric analysis reveals a strong impact of income and of intergenerational effects. Education of adults in the household and the availability of infrastructure are other important determinants of children's growth attainment. Finally, even controlling for income and other household and community characteristics, ethnicity remains an important determinant of child nutritional status. The study also reveals an increasing prevalence of excess weights and obesity among children and adults. Overnutrition tends to be higher among individuals living in urban areas and among non-poor and non-indigenous households.

This paper—a product of the Human Development Sector Unit, Latin America and the Caribbean Region—is part of a larger effort in the region to study poverty and human development processes. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Michele Gragnolati, room MC11-234, telephone 202-458-5287, fax 202-522-2955, email address mgragnolati@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. Alessandra Marini may be contacted at amarini@worldbank.org. January 2003. (54 pages)

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Executive Summary

Some progress has been made towards understanding the causes and consequences of child malnutrition in the development of poor countries. Nevertheless, substantial gaps remain in our knowledge about the size and distribution of health and nutrition problems, the determinants of health and nutrient status, the impact of health and nutrition on socioeconomic development, and how to design appropriate nutritional policies.

This document has two objectives. The first is to provide up-to-date information on the characteristics and patterns of the nutritional status of children and adults in Guatemala using data from the ENCOVI/INE survey that was carried out in 2000. The second goal is to provide some guidelines and a set of concrete policy recommendations for future action based on these findings.

The Prevalence of Chronic Child Malnutrition

Guatemala has among the worst indicators in the world in terms of child growth attainment. Not only is the prevalence of chronic malnutrition in Guatemala (44 percent in 2000) much higher than in any other country in the Latin American and the Caribbean region, but it is also among the highest among all countries in the world for which reliable information is available. Although the prevalence of stunted children in Guatemala has declined from 59 percent in 1987 to 44 percent in 2000, the percentage yearly rate of change (less than 2 percent) has been the slowest in the Latin American and the Caribbean region. For example, between 1986 and 1996, Brazil (with a yearly rate of change of more than 6 percent) reduced chronic malnutrition three times faster than Guatemala.

Inequality

Our analysis shows very large differentials in the prevalence of child malnutrition among children of different socioeconomic and geographic groups. Malnutrition is concentrated among the poor, the least educated households, the rural population, and indigenous people. Only 16 percent of children in the richest quintile of households (in terms of per capita consumption) are chronically malnourished. The corresponding proportion is 62 percent among children in the poorest quintile. Only 20 percent of children whose mother or father have more schooling than primary education are stunted. The corresponding figure is three times as high among children whose parents did not complete primary education (60 percent). The prevalence of stunting is 31 and 50 percent in urban and rural areas respectively. The prevalence of chronic malnutrition is almost twice as high among children of indigenous families (58 percent) as among children of non-indigenous families (32 percent).

Determinants

Malnutrition is the product of the interaction of many factors, including individual and household decisions, community infrastructures, the cultural and natural environment in which individuals live, national policies, and international economic conditions.

Poverty. High rates of malnutrition jeopardize future economic growth by reducing the intellectual and physical potential of the population. Malnutrition, therefore, contributes to creating poverty. Conversely, poverty boosts malnutrition by reducing an individuals' access to food and increasing their exposure to disease. In Guatemala, 64 percent of extremely poor and 53 percent of all poor children are stunted, while the corresponding figure for the non-poor is 28 percent.

Disease. Morbidities, especially diarrhea and respiratory infections, are both causes and consequences of malnutrition. Stunting rates are much higher among children with frequent exposure to diarrhea or respiratory infections. Disease prevention and treatment, together with increasing the availability and improving the quality of water and sanitation are critical for fighting chronic malnutrition.

Education and Literacy. The level of education attained by adults in a household is among the most important determinants of children's growth attainment. The positive impact of parents' education on child height can operate through different mechanisms, which are normally unrelated to the school curriculum. Education can reflect a greater ability to acquire information (obtained through reading newspapers, watching television, or listening to the radio) or a previous investment made by the family of the child's parents. Education can also have indirect effects by bringing an individual more income and greater self-confidence.

Family Planning. Guatemala is characterized by a very high fertility rate and very low knowledge of birth control methods, especially among the poor. Pregnancies at a young age, high numbers of children, and short intra-birth intervals are associated with child deficient growth patterns.

Breastfeeding. Breastfeeding is one of the most important household actions that influence children's nutritional outcomes and that can be modified through policies and programs. Exclusive breastfeeding for at least the first six months of life provides a baby with an adequate source of nutrients and antibodies and eliminates the risks of illnesses associated with the use of infected utensils to feed formula. Moreover, in a country where contraceptive use is as low as in Guatemala, breastfeeding plays a major role in repressing fertility by extending the duration of post-partum amenorrhoea.

Community Infrastructure. The availability of infrastructure such as piped water, flushable toilets, television, and garbage collection systems contribute to improving the nutritional status of children.

Micronutrients

Although Guatemala is a pioneer in Central America in terms of in adopting micronutrient fortification programs, very few of its programs are successful, mostly because of interruptions in the service, weak regulation, and poor targeting. Up-to-date information is not available on the outcomes of such programs, and an in-depth and rigorous nationally representative evaluation of the impact of such programs should be a priority for the government.

The Guatemalan people receive very little supplementation of iodine through salt and of folic acid through wheat flour. The percentage of women affected by anemia (35 percent in 1995) is the second highest in the Central American region. Malnutrition among women is of particular concern because of the potential consequences for babies' birth weight and infant mortality.

Only 16 percent of Guatemalan infants surveyed in 1999 met the daily caloric requirement, and only about one-third received an adequate intake of protein. Only 2 percent of the children in the sample had diets that provided the recommended intake of iron. Most children, however, did meet vitamin A requirements.

Adult Undernutrition

The ENCOVI/INE collected anthropometric information for all individuals in the surveyed households, thus making it possible to do a complete study of the growth attainment of the entire Guatemalan population.

Adult under-nutrition does not constitute a serious health concern in Guatemala. Less than 1 percent of adults are classified as severe or moderate malnourished, while 2 percent are mildly malnourished. Disaggregated figures indicate that urban adults tend to be fatter than rural individuals regardless of their economic status. There is no significant difference in Body-Mass Index (BMI), which is the preferred indicator of adult nutritional status, between indigenous and non-indigenous people. Adult mild malnutrition is twice as high among extremely poor adults than among non-poor adults. Moderate and severe malnutrition do not vary significantly with poverty status.

Obesity

Several studies document an increasing prevalence of excess weights and obesity among children in industrialized countries, while less information is available for developing countries. ENCOVI/INE data indicate that the prevalence of obese children in Guatemala increased from 2.7 to 5.4 percent between 1987 and 2000. Obesity tends to be higher among children living in urban areas and among non-poor and non-indigenous households. Guatemala is undergoing a rapid nutritional transition, characterized by the adoption of Western diets that are higher in saturated fats, sugar, and refined foods, which may explain the observed pattern.

Adult over-nutrition constitutes a serious health concern in Guatemala. Guatemalan women have the highest prevalence of obesity and excess weight in the Latin American region (16 and 32 percent respectively). Moreover, both excess weight and obesity have increased in Guatemala over the last few years. Obesity has almost doubled between 1995 and 2000, increasing from 8.1 to 16.0 percent.

Recommendations

Because of the many causal mechanisms that are involved in promoting the growth of children, chronic malnutrition is mostly mitigated by generally improving the living conditions of families. However, increasing household income is not enough to guarantee a reduction in malnutrition. Similarly, simply augmenting food production does not necessarily improve nutritional status; poor health and a lack of access to basic health services could put children who have an adequate caloric intake at risk.

In countries like Guatemala, where almost half of all children are malnourished, it is vital that the government should take targeted and concerted actions in the areas of health, access to basic services, education, and specific nutritional interventions with the support of donors and the participation of civil society. These actions are needed to accelerate the decline in the prevalence of chronic malnutrition. Although it is not part of our study to analyze the government's strategy and programs addressing the different aspects of malnutrition, we can make some comments on the existing framework and recommendations on future actions. For many years, the government has tried to integrate its actions in different sectors with the aim of guaranteeing access to adequate amounts of food and ensuring the conditions necessary for a healthy lifestyle. However, so far, these different programs have only had a very limited effect.

Evidence shows that the following types of interventions are likely to be most successful in tackling the causes of malnutrition among Guatemalan adults and children:

- *Community-based Programs.* A lack of appropriate nutrition information and incorrect feeding practices for infants and young children are key causes of child malnutrition. A person's nutritional status improves largely due to changes in his or her behavior. Yet Guatemala has introduced very few community-based programs, which have proven to be successful in producing this change in awareness and behavior in many countries of Latin America. Analysis of different programs in other

parts of the world has also shown that community-based programs are the most cost-effective interventions for child malnutrition.

- *Mothers' Nutritional Status and Child Growth Monitoring.* The government's current nutritional strategy focuses on feeding programs and school-based programs, which are not directly addressing the most vulnerable groups, in other words, children under the age of two and pregnant women.

- *Micronutrient Supplementation Programs.* Guatemala's initial commitment to micronutrient supplementation programs and the relative success of the fortification of sugar with Vitamin A show that the country's is capable of addressing the problem of malnutrition among the most vulnerable groups. However, the failure of most of the other supplementation programs signals a need for proper monitoring of micro-nutritional programs and policies to bring Guatemala up to speed with international recommendations. In particular, the starting point should be the implementation of an information system to collect periodic and consistent data on micronutrient deficiency.

The following are the key groups that these programs should target:

- *Preschool Children and Pregnant Women.* Preschool children should be directly targeted, in contrast to most of the existing programs that only target children in school. Malnutrition does its greatest harm to children under 24 months old, which is the period of greatest brain development and greatest vulnerability. Children's malnutrition can be partly traced back to low birth weight (and, therefore, to maternal malnutrition). Another critical period is between 6 and 24 months when infants make the transition from being exclusively fed with breast milk (which provides all the nutrient and antibodies needed by the infant) to a diet of solid and liquid foods (often contaminated and of poor quality).

- *Household-level Programs.* Nutritional education programs are needed at the household level. By emphasizing the importance of a more balanced diet, they could address both children's under-nutrition and the increasingly worrying phenomenon of adult over-nutrition.

At the moment there is no individual to whom the President, the Congress, Ministers, or donors can turn to for authoritative advice on nutrition. This lack of leadership and vision means that there is a lack of direction and prioritization among programs and that there are significant overlaps and gaps and much inconsistency. It is necessary to address the leadership and organizational gap at the national level as soon as possible and to build into the process a system of oversight by civil society so that the overall direction, resources, and priorities do not change with each change of government.

Guatemala has the highest rate of chronic malnutrition in Latin America. Yet the government's strategic framework appears to have no guiding vision on nutrition, no clear division of labor across ministries, no adequate control of resources, and no accountability. Nor is there a mechanism for assessing how programs perform. Functional leadership is absent, and the lack of a clear vision about nutrition shared by government and stakeholders alike means that nutrition is neglected in terms of both the mobilization and the deployment of resources.

Introduction

"El Estado velará porque la alimentación reúna los requisitos mínimos de salud. Las instituciones especializadas del Estado deberán coordinar sus acciones entre si, o con organismos internacionales dedicados a la salud, para lograr un sistema nacional efectivo."[1]

This paper was prepared as background for the World Bank's Poverty Assessment for Guatemala. The findings presented in the report are based on the Guatemalan Living Standard Measurement Survey (ENCOVI 2000/INE), a nationally representative, multipurpose household survey carried out during the period from July to December 2000. ENCOVI 2000 data are available for 7,276 households (37,771 individuals) located in urban and rural areas of 22 departments in eight regions all over Guatemala.

The objective of the present analysis is to document the presence and distribution of malnutrition among children and adults, to analyze the relationship between selected child, maternal, household, and community characteristics and children's nutritional status, and to outline the implications of the most important findings for nutritional policy.

Guatemala is a very diverse country: demographically, geographically, ethnically, economically, and socially. The total population of Guatemala in 1999 was approximately 11 million people, implying an average density of 96 people per square kilometer. Elevations range from sea level to about 3,800 meters. Despite the fact that one-fifth of the population lives in Guatemala City and that the country as a whole has had a relatively high rate of population growth (2.6 percent between 1994 and 1999), Guatemala is the least urbanized country in Central America, with only 39 percent of the people living in urban areas. Guatemala is divided into 22 administrative departments, each of which is divided into municipalities, which are comprised of individual communities. While Guatemala is the most populous country and the largest economy in Central America, its rural and Mayan population still faces great difficulties, being excluded socially, economically and politically due to language and geographical barriers and to a lack of education and economic opportunities.

Compared with other countries, Guatemala stands out as having an inordinately high rate of poverty for its level of per capita GDP. According to the most recent estimates, 56 percent of Guatemalan families lived below the poverty line in 2000, which is defined as having insufficient income to purchase a basic basket of goods and services. Among these, 16 percent were in extreme poverty, which means that they could not afford a simple basic basket of food. These two figures are higher for the indigenous sub-population–76 percent and 27 percent respectively. [2]

The poverty of Guatemalans is revealed indirectly by the anthropometric outcomes of their children. The ENCOVI 2000/INE, based on nationally representative cross-sectional data, gathered anthropometric data on all individuals. It reveals that the prevalence of stunting (low height-for-age) among Guatemalan children under the age of three in 2000 (44 percent) was the highest in Latin America. Moreover, among all countries for which there is reliable and comparable information, only Bangladesh and Yemen have a

[1] "The nation will make sure that food meets the minimum health requirements. The national institutions must coordinate their actions and cooperate with the international organizations that are working on health in order to achieve an effective national system", *Constitución Política de la República de Guatemala, Título II Derechos Humanos, Capítulo II. Derechos Sociales, Sección Séptima "Salud, seguridad y Asistencia social", artículo 99. Alimentación y Nutrición*

[2] World Bank estimates based on ENCOVI 2000/INE.

higher prevalence of stunting–55 percent and 52 percent respectively. In addition, the prevalence of underweight children (low weight-for-age) in Guatemala was 22 percent, the highest in Latin America. The prevalence of wasting (low weight-for-height), however, was very low (2.8 percent). We present these findings, together with the analysis of patterns of under-nutrition by geographical area, children's ages, households' poverty status, and the ethnicity and education of the parents, in Part I. Part I also contains the results of our multiple linear regressions of the determinants of malnutrition in the population and an analysis of the characteristics and patterns of micronutrient deficiency as well as the country's most important supplementation programs. In Part II, we analyze adult malnutrition in Guatemala. The fact that the ENCOVI/INE collected anthropometric information for all individuals in the surveyed households allowed us to make a complete study of the growth attainment of the entire Guatemalan population, using the Body-Mass Index (BMI) as the preferred indicator of adult nutritional status. In Part III, we explore the issue of excess weight and obesity among both children and adults, and in Part IV, we present our recommendations. Finally, in an appendix, we present the main indicators (both anthropometrics and based on micronutrients) and the methodology that we used in the study.

I: Child Malnutrition in Guatemala

Malnutrition in young age carries serious long-term consequences. Malnutrition increases the risks of death and impairs cognitive development in children, affecting their future productivity and earnings. Often, malnourished children also lack essential micronutrients such as iodine, iron and vitamin A, whose deficiency has serious consequences on health and learning ability. The study will use both anthropometric and micronutrient deficiency indicators to analyze the prevalence of malnutrition in Guatemala.

Anthropometry

Based on the anthropometric measures (weight and height) collected by the ENCOVI/INE 2000, three nutritional indicators were calculated to assess children (less than 5 years old) malnutrition: (i) height for age (HFA), a measure of "stunting", or chronic malnutrition; (ii) weight for age (WFA), a measure of underweight; (iii) weight for height (WFH), a measure of "wasting" or acute malnutrition[3]. The following sections analyze the prevalence of child malnutrition in Guatemala using those anthropometric indicators.

Regional Comparisons. The prevalence of malnutrition is much higher in Guatemala than in its neighboring Central American countries and than in any other country in Latin America (Table 1.1).[4] Also, malnutrition, as measured by the prevalence of stunting among children under the age of five, appears to be higher in Guatemala than in most of the other developing countries for which DHS data are available[5]. Moreover, acute malnutrition and underweight rates in Guatemala are higher than the prevalent rates in any other Central and Latin American country but are much lower than in other regions of the world.

[3] For more details on the different indicators of malnutrition, see Appendix 1.

[4] The countries were selected based on available comparable data.

[5] The Demographic and Health Surveys (DHS) are nationally representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition. Two features of the ENCOVI/INE 2000 differentiate it substantially from the DHS survey. First, detailed information was collected on household expenditure patterns in order to be able to construct an appropriate indicator of household resource availability. Second, the ENCOVI collected anthropometric information for all household members, not just on preschool children and pregnant women.

Table 1.1:The Prevalence of Malnutrition in Selected Developing Countries

	Stunted (Chronic)	Wasted (Acute)	Underweight
Sub-Saharan Africa			
Ethiopia 2000	51.2	10.7	47.1
Malawi 2000	49.0	5.5	25.4
Tanzania 1999	42.6	5.4	28.9
Zambia 1996	42.4	4.2	23.5
Chad 1997	40.1	14.1	38.8
Uganda 2000/01	38.6	4.0	22.5
Near East/North Africa/Europe/Eurasia			
Yemen 1997	51.7	12.9	46.1
Turkey 1998	16.0	1.9	8.3
Asia			
Nepal 2001	50.5	9.7	48.4
Bangladesh 1999/2000	44.6	10.3	47.6
Cambodia 2000	44.3	15.0	45.0
Latin America & Caribbean			
Guatemala 2000/1	**44.2**	**2.8**	**22.3**
Mexico, 1996/2	33.9	7 0	16.9
Bolivia 1998	26.8	1.3	7.6
Ecuador 1998/3	26.4	2.4	14.3
Peru 1996	25.8	1.1	7.8
Nicaragua 1997/8	24.9	2.2	12.2
Haiti 2000	21.9	4.6	16.8
Panama 1997/4	14.4	1.1	6.8
Colombia 2000	13.5	0.8	6.7
Dominican Republic 1996	10.7	1.2	5.9
Brazil 1996	10.5	2.3	5.7

Note Children < 5
Sources. DHS, 1/ World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística – Guatemala, 2/Nicaragua LSMS 1998 and 3/ Panama LSMS 1997.

Although we refer to wasting and being underweight, the main focus of this report is on chronic malnutrition. There are two reasons for this: (i) stunting is the most important form of malnutrition among children aged 0-5 in Guatemala[6] and (ii) since weight-for-age is a composite of weight-for-height and height-for-age, deficits in weight-for-age in Guatemalan children almost entirely reflect deficits in height-for-age.

The prevalence of stunting has decreased from 57.8 percent to 44.2 percent between 1987 and 2000 (Table 1.2) but not as quickly as in the other Latin American countries.

[6] Since the prevalence of low weight-for-height is rare in Guatemala, much larger samples would be needed to explore the correlates of this condition.

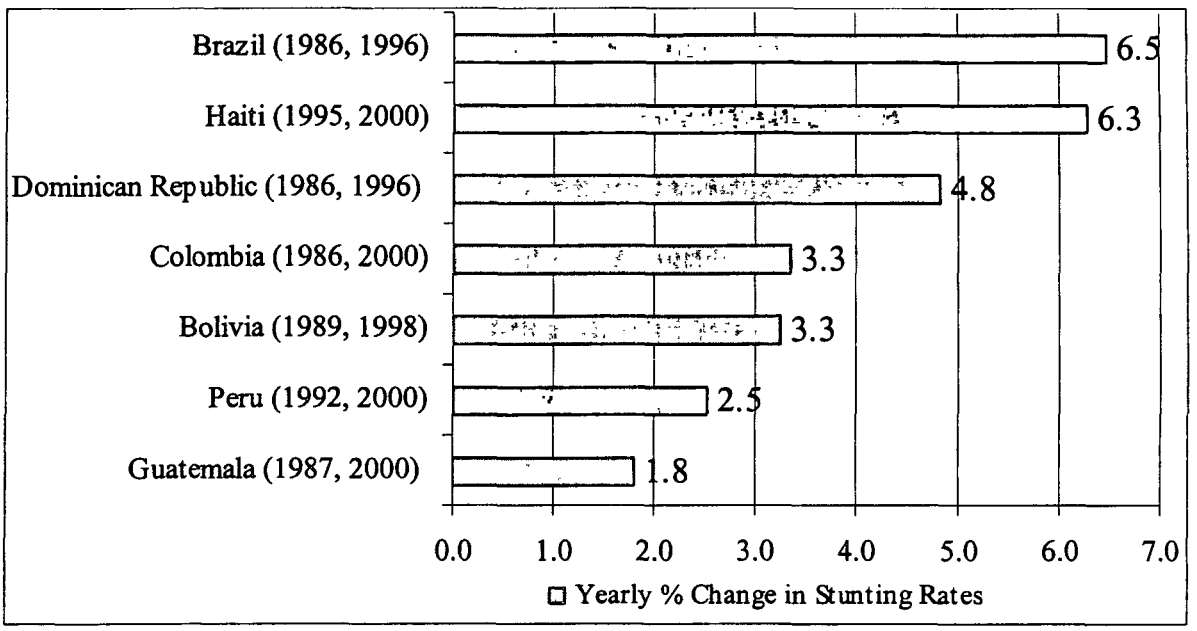
Table 1.2: The Prevalence of Malnutrition in Guatemala – Historical Trend

	Stunting Rates		
	Male	Female	Total
1987	58.8	56.8	57.8
1995	50.4	49.1	49.7
1997/8	47.6	45.1	46.4
2000	43.6	44.9	44.2

Note: Children < 5
Sources DHS and World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

The limited progress in reducing malnutrition achieved by Guatemala is evident in Figure 1.1. The yearly reduction in malnutrition prevalence (less than 2 percent in Guatemala) is the lowest in the region.[7] Brazil, on the other hand, succeeded in reducing prevalence of stunting from 30 percent in 1986 to 15 percent in 1996 (a yearly reduction rate of 6 percent).

Figure 1.1:Progress in Reducing Stunting in Guatemala and Latin America

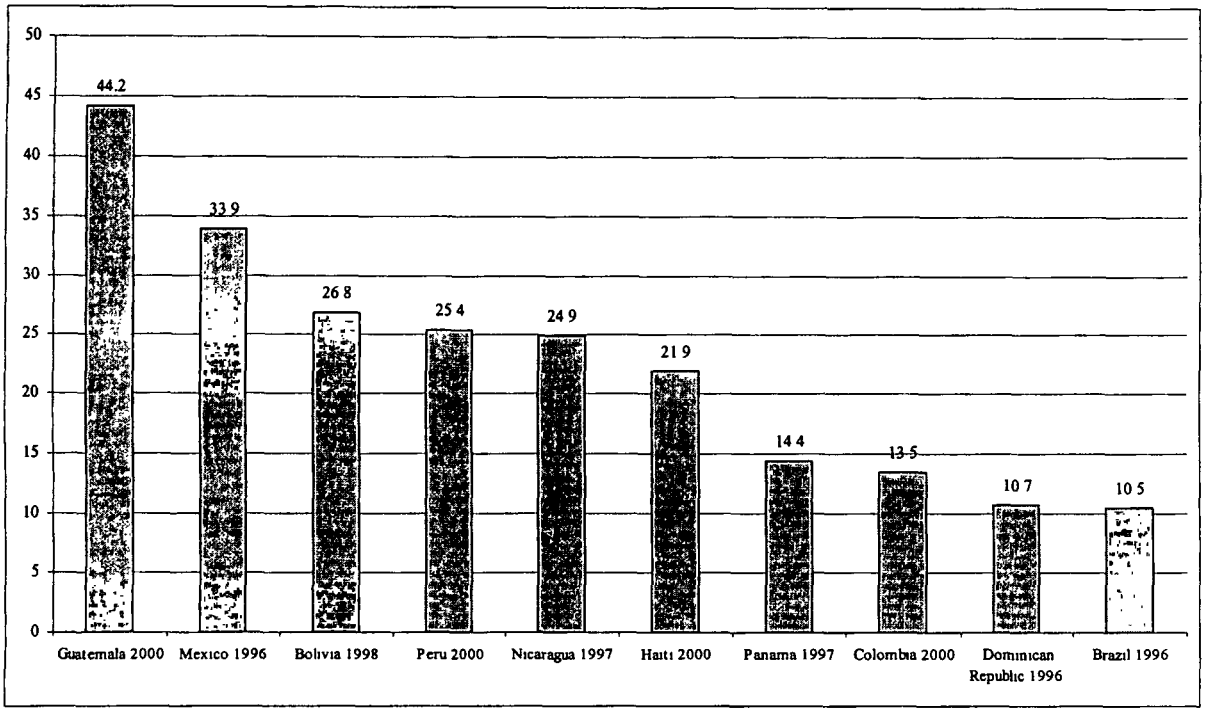


Note Children < 5
Sources. DHS and World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala.

Figure 1.2 presents malnutrition rates in Guatemala and other Latin American countries. The stunting rate in Guatemala (44 percent) in 2000 was significantly higher than the second highest rate in the region in Bolivia in 1998 (27 percent).

[7] Assumes a linear change over time.

Figure 1.2: The Prevalence of Malnutrition in Guatemala and Latin America - Last Available Observations



Sources DHS and World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Characteristics and Patterns. In order to identify the most vulnerable groups in Guatemala, we analyze malnutrition rates[8] in this sub-section by demographic and socioeconomic characteristics. Table 1.3 presents malnutrition rates by gender and age. No significant gender bias is evident, which is consistent with the patterns observed in other Latin American and Caribbean countries and with previous findings from Guatemala.

Since malnutrition is a cumulative phenomenon, malnutrition rates, as measured by the three different indicators (stunting, wasting, and underweight), increase with children's ages (Table 1.3 and Figure 1.3). The prevalence of stunting increases until the age of 24 months and then tends to stabilize at about 50 percent. Malnutrition is, therefore, higher when it is most harmful to the child, in other words, during the first months of life. Children's brains grow most rapidly in early childhood and, at the same time, they are more vulnerable because their immune systems are not yet fully developed. The largest increase in malnutrition occurs between 6 and 24 months while children are being weaned. The weaning period, when infants make the transition from being exclusively fed with breast milk (which provides all of the nutrient and antibodies needed by the infant) to a diet of solid and liquid foods (often contaminated and of poor quality), is a critical period for the baby's nutritional status. The risk of malnutrition increases during this period, especially if children come from large and poor families, because the babies may not get enough nutrients from the food they are given, either because they are not given enough food or because the food they are given is of poor quality.

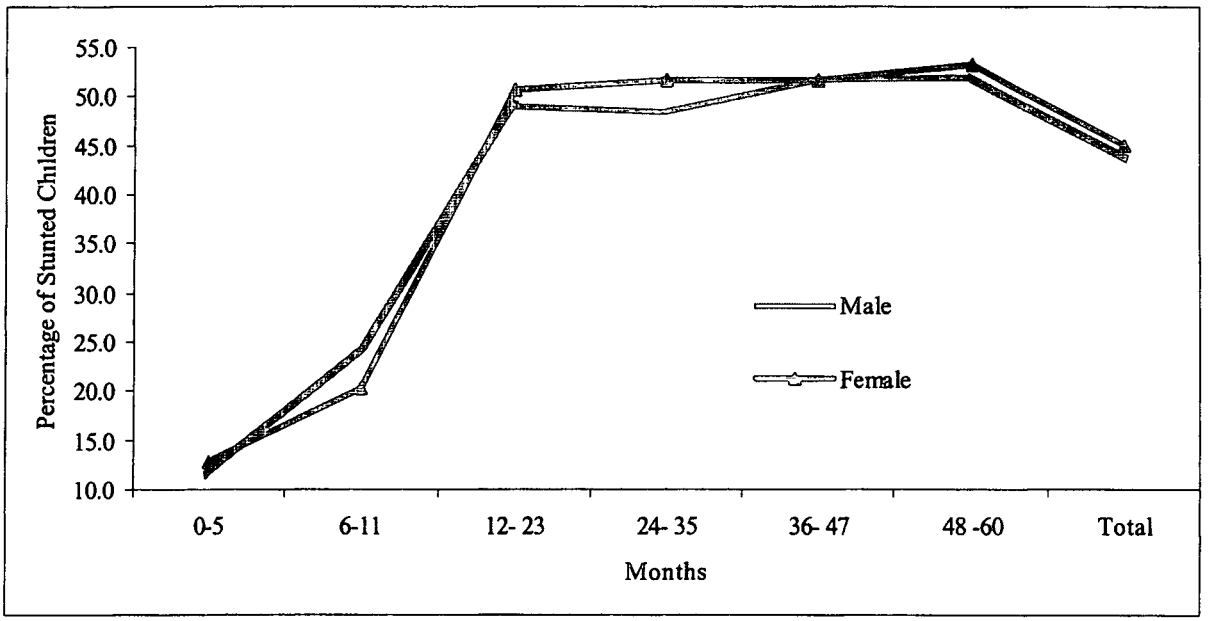
[8] In this sub-section, malnutrition refers to under-nutrition Overnutrition and obesity are examined in Part III.

Table 1.3: The Prevalence of Child Malnutrition by Age Group and Gender

Age Groups (months)	0-5	6-11	12- 23	24- 35	36- 47	48 -60	Total
Stunted							
Total	12.1	22.3	49.8	50.1	51.8	52.5	44.2
Male	11.5	24.4	49.2	48.6	51.9	52.0	43.6
Female	12.9	20.2	50.4	51.6	51.7	53.1	44.9
Wasted							
Total	2.0	3.3	5.3	2.8	1.1	2.3	2.8
Male	2.3	2.7	6.2	3.6	1.4	3.1	3.4
Female	1.7	4.0	4.3	2.0	0.8	1.4	2.3
Underweight							
Total	1.2	15.1	30.4	30.0	24.4	19.1	22.3
Male	0.7	15.8	27.9	30.7	22.0	17.7	21.0
Female	1.8	14.4	33.1	29.4	26.8	20.7	23.7

Note: Children < 5
Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

Figure 1.3: Stunting Rates by Age and Gender, Guatemala 2000



Note: Children < 5
Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

Table 1.4 displays the percentage of stunted children among children of different ethnic categories in Guatemala. The table confirms the existence of a very marked difference in child nutrition among different socioeconomic groups, which was also found in previous research in Guatemala.[9] The prevalence of stunting of children of ladino (non-indigenous) families is about 33 percent, while it is almost 60 percent among children of indigenous families. In particular, among the different ethnic groups, children from Mam and the other Mayan families appear to be most disadvantaged; the prevalence of severely stunted children among these groups averages around 40 percent.

Table 1.4: The Prevalence of Child Malnutrition by Ethnicity

	Stunted	Severely Stunted	Wasted	Severely Wasted	Underweight	Severely Underweight
Total	44.2	22.3	2.8	0.9	22.3	5 1
Ethnicity						
Indigenous	57.6	30.0	2.6	1.2	27.8	7.2
K'iche	59.0	30.2	3.7	1.8	27.7	7.7
Q'ueqchi	44.8	16.9	3.3	1.4	18.7	5.2
Kaqchiquel	54.5	22.2	1.1	-	19.9	3.1
Mam	65.3	41.2	1.6	0.5	39.4	10 5
Other Mayan	62.5	37.4	3.4	2.2	31.9	9.1
Other Indigenous	35.9	12.5	3.2	-	6.3	-
Non-indigenous	32.5	15.5	3.0	0.6	17.4	3.3

Note Children < 5 Stunted includes Severely Stunted, Wasted includes Severely Wasted, and Underweight includes Severely Underweight Source· World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

Among Guatemalan children of indigenous families, malnutrition varies significantly with their parents' ability to speak Spanish. The prevalence of stunting is 61 percent if one of the parents does not speak Spanish, while it decreases to 55 percent if the indigenous mother speaks Spanish and to 44 percent if the father speaks Spanish.

Table 1.5: – The Prevalence of Child Malnutrition in Indigenous Families - Parents' Ability to Speak Spanish

	Stunted	Severely Stunted	Wasted	Severely Wasted	Under-weight	Severely Under-weight
Total	44.2	22.3	2.8	0.89	22.3	5.1
Indigenous mother speaks Spanish	54.4	23.4	2.8	0.4	23.9	4.9
Indigenous mother does not speak Spanish	60.1	32.6	2.7	1.5	29.3	8.1
Indigenous father speaks Spanish	43.8	17.6	2.5	0.5	19.0	3.9
Indigenous father does not speak Spanish	60.4	32.3	2.5	1.3	29.0	8.3
No indigenous parent speaks Spanish	60.8	32.8	2.6	1.4	29.5	8.5

Note Children < 5
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

Differentials in children's malnutrition levels by their mothers' and fathers' education levels are very large. The prevalence of malnutrition as measured by any of the three indicators is much lower among children whose father or mother has more than primary education. Stunting, in particular, is as low as 23

[9] Pebley and Goldman, 1995 and Gragnolati, 1999.

percent. Note also that mothers' primary education is associated with lower child malnutrition rates than fathers' primary education (40 percent and 45 percent respectively). If both parents are illiterate, then the prevalence of malnutrition as defined by any of the three indicators (stunting, wasting, and underweight) reaches the highest levels (60 percent, 3 percent, and 32 percent respectively).

Table 1.6: The Prevalence of Child Malnutrition by Parents' Education

	Stunted	Severely Stunted	Wasted	Severely Wasted	Under-weight	Severely Under-weight
Total	44.2	22.3	2.8	0.89	22.3	5.1
Mother has no education	56.5	32.3	3.5	1.2	30.4	8.7
Mother has primary education	39.9	16.9	2.5	0.8	18.4	3.1
Mother has more than primary education	22.6	10.8	2.0	0.2	10.6	1.0
Father has no education	58.1	31.9	2.9	0.9	31.6	7.9
Father has primary education	45.2	22.4	2.6	1.0	22.7	5.0
Father has more than primary education	23.3	8.5	2.6	0.5	7.0	1.3
Both parents have no education	60.4	34.1	3.4	1.2	32.2	9.5

Note: Children < 5
Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística – Guatemala.

Figures in Table 1.7 confirm the existence of a very marked gradient in the nutritional status of children from families with different compositions. In particular, children of households with many siblings younger than five years old are worse off. The prevalence of stunting reaches 76 percent if there are six children in the household, whereas it is only 33 percent in households with only one child. In contrast, a higher number of adult women in the household is associated with lower levels of children malnutrition, which indicates that children receive extra care and assistance in households with many women members. The prevalence of chronic malnutrition is slightly lower for children living in households headed by women than in those headed by men

Table 1.7: The Prevalence of Child Malnutrition by Household Composition

	Stunted	Severely Stunted	Wasted	Severely Wasted	Underweight	Severely Underweight
Total	44.2	22.3	2.8	0.89	22.3	5.1
Number of Children <5						
one	33.4	15.4	2.4	0.5	15.1	2.9
two	49.2	24.3	2.8	1.1	24.8	5.6
three	52.5	28.9	2.7	0.8	26.8	6.2
four	51.9	34.5	9.3	3.3	36.4	16.5
five	53.7	35.9	5.3	-	41.3	13.2
six	76.3	57.1	-	-	56.8	13.5
Number of Women >14						
zero	40.2	25.3	-	-	25.8	2.7
one	44.4	21.8	3.0	0.8	22.0	4.8
two	44.2	23.7	2.9	1.7	23.5	6.6
three	47.2	23.9	2.7	0.2	23.6	5.3
four	34.7	16.7	1.3	1.3	16.1	3.9
five	36.9	28.7	-	-	10.2	5.1
six	15.0	15.0	-	-	5.6	-
Woman head of the household	41.5	20.0	3.0	0.3	19.1	3.7
Men head of the household	44.6	22.6	2.8	1.0	22.7	5.3

Note Children < 5
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

Table 1.8 presents data on under-nutrition by geographical region and shows that the prevalence of child malnutrition is highest in the Noroccidente region. This is consistent with the pattern observed in previous DHS surveys. The lowest levels of malnutrition are in the Metropolitana region.[10]

There is a large difference in levels of chronic malnutrition between urban and rural areas, with stunting rates peaking at more than 50 percent in rural areas while reaching only 30 percent in urban areas. Note that, while trends in urban malnutrition resemble those of the non-indigenous population, indigenous children have higher rates of chronic malnutrition than children living in rural areas. This may have to do with the fact that the ethnicity is capturing some other factors like social exclusion or a lack of access to particular services.

[10] The vulnerability analysis conducted by the World Food Program identified the Western and Eastern highlands and the North as the most vulnerable regions in Guatemala. The Western highlands are characterized by an adverse climate and a tendency to freeze. Given the limited access that most poor people have to land, the woods in this area are exploited for agricultural activity; the deforestation rate is very high and, as a consequence, soil erosion is a problem. The Eastern regions are characterized by a general lack of rainfall and are, therefore, predisposed to droughts and fires. Deforestation is a serious issue in this area, the quality of land is very poor, and the agricultural productivity of the region is one of the lowest in the country. The Northern region is characterized by mountainous land, high deforestation, and frequent rainfall, which cause frequent floods in the flat lands. Part of the department of Peten is included in this vulnerable region (PMA, 2001).

Table 1.8: – The Prevalence of Child Malnutrition by Area and Region

	Stunted	Severely Stunted	Wasted	Severely Wasted	Under-weight	Severely Under-weight
Total	44.2	22.3	2.8	0.89	22.3	5.1
Area						
Urban	31.2	12.9	2.4	0.5	11.3	1.6
Rural	50.5	26.8	3.1	1.1	27.5	6.8
Region						
Metropolitana	30.0	11.9	2.2	0.3	9.4	1.1
Norte	47.0	21.5	2.8	1.1	23.6	5.5
Nororiente	34.2	17.0	4.6	2.4	22.0	6.5
Suroriente	41.4	18.1	3.3	0.3	20.0	5.1
Central	41.8	18.9	2.2	0.3	15.7	2.3
Suroccidente	50.1	28.4	3.1	1.1	30.8	7.4
Noroccidente	60.6	35.2	2.5	1.0	29.2	7.5
Peten	36.9	13.0	1.5	0.5	14.4	2.4

Note: Children < 5
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística – Guatemala

The prevalence of malnutrition decreases monotonically as one goes up the quintiles of the distribution of total per capita consumption (Table 1.9). In particular, the poorest individuals in the population have levels of chronic malnutrition that are almost four times higher than levels experienced by the richest individuals (62 percent and 16 percent respectively). The differentials in underweight are even more pronounced, starting at 5 percent for the richest quintile and reaching 35 percent for the poorest one. On the other hand, there is no clear pattern across different consumption quintiles for acute malnutrition.

Table 1.9: The Prevalence of Child Malnutrition by Economic Group

	Stunted	Severely Stunted	Wasted	Severely Wasted	Under-weight	Severely Under-weight
Total	44.2	22.3	2.8	0.89	22.3	5.1
Quintile						
Q1	62.1	37.4	3.5	1.3	35.2	10.1
Q2	51.8	24.8	3.1	0.9	25.3	6.1
Q3	40.9	18.1	1.8	0.4	21.6	2.5
Q4	29.2	10.8	3.3	1.2	10.3	2.3
Q5	15.7	6.6	1.8	0.2	4.5	0.6
Poverty Level						
Extremely Poor	63.5	38.0	3.9	1.3	35.8	10.4
All Poor	53.0	27.7	3.0	1.0	28.3	6.8
Non-poor	26.6	11.3	2.5	0.7	10.2	1.8

Note: Children < 5. All poor includes extremely poor.
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística – Guatemala

The Determinants of Malnutrition. The descriptive analysis presented in the previous sub-section highlights some of the differentials in the prevalence of malnutrition among socioeconomic groups and geographical areas. Anthropometric information was collected alongside household consumption data in ENCOVI/INE 2000, making it possible for us to explore the relationship between nutrition and poverty at the national level. In this sub-section, we use multivariate regression analysis to shed light on the relative

importance of the individual, household, and community factors that influence children's chronic malnutrition. We estimated "quasi-reduced form" models of the determinants of malnutrition (see Appendix 1 for an explanation of this methodology). We estimated separate models for urban and rural areas and for children younger and older than two years old.[11] Summary statistics of the variables included in our analysis of the 5,414 children younger than five in the ENCOVI/INE 2000 sample are reported in Table 1.10.

Table 1.10: Means and Standard Deviations

Variable	Obs	Mean	Std. Dev.	Min	Max
Height-for age	5414	-1.675	1 642	-5 99	5 84
6-11 Months	5414	0.104	0.306	0	1
12-23 Months	5414	0.197	0 398	0	1
24-35 Months	5414	0.199	0.399	0	1
36-47 Months	5414	0.193	0 395	0	1
48-59 Months	5414	0.203	0 402	0	1
Male Dummy	5414	0 506	0.500	0	1
Household Size	5414	6 674	2 673	2	18
Number of Kids (<5) in Hh	5414	1 876	0 828	1	6
Number of Women >14 in Hh	5414	1.498	0.850	0	6
Woman Headed Household	5414	0 111	0 315	0	1
Mother Has Competed Primary Education	5414	0.607	0 489	0	1
Father Has Competed Primary Education	5414	0.783	0.412	0	1
Mother's Height	5343	143.261	26 120	0	184 6
Father's Height	4934	130 387	62 743	0	190 5
Non-indigenous Mother	5414	0 532	0 499	0	1
Indigenous Mother Speaks Spanish	5257	0 103	0.304	0	1
Indigenous Mother does not Speak Spanish	5257	0.368	0.482	0	1
Urban Dummy	5414	0 371	0 483	0	1
Proportion of Families with Bottled Water	5414	0 114	0.199	0	1
Proportion of Families with propane	5414	0 680	0 467	0	1
Proportion of Families with electricity	5414	0 772	0 419	0	1
Proportion of Families with Smoke Escape (if use wood)	5414	0 177	0 242	0	1
Proportion of Families with Smoke Escape (if don't use wood)	5414	0 493	0.339	0	1
Proportion of Families with Piped Water	5414	0.636	0 398	0	1
Proportion of Families with Toilet in the House	5414	0 238	0 345	0	1
Proportion of Families with Telephone	5414	0.095	0.203	0	1
Proportion of Families Using Garbage Collection	5414	0.160	0 298	0	1
Proportion of Families with TV	5414	0.441	0.348	0	1
Average Milk Price	5414	18 972	1.151	14 00	22 65
Average Rice Price	5414	2.312	0 225	1.50	3.25
Average Beans Price	5414	2.515	0 408	1 00	4 25
Average Wheat Price	5414	0.866	0.229	0.37	2 75
Average Sugar Price	5414	1 788	0 105	1 45	2 25
Average Vegetable Oil Price	5414	7 521	0.889	2 42	10 00
Log Per Capita Consumption	5414	8 138	0 701	5.81	11 16
Wealth Index	5414	-0.961	2 708	-4.96	9 47
Non-wage Income	5414	887 3	2773.8	0	119509 1
Per Capita Land	5414	19379.6	681811.2	0	3 33E+07
Average Time to health facilities	5414	50.865	33 259	5	360 00
Norte region	5414	0 127	0 333	0	1
Nororiente region	5414	0.064	0.244	0	1
Suroriente region	5414	0 103	0 305	0	1
Central region	5414	0.174	0 379	0	1
Suroccidente region	5414	0.153	0 360	0	1

[11] Aggregation across geographical area and age groups implicitly assumes that the quasi-reduced form model is common across those groups, in other words, that the effect of different determinants of chronic malnutrition does not vary by location and age group. Previous studies (Barrera, 1990; Thomas and Strauss, 1992, and Sahn and Alderman, 1997) actually showed that the effects of different determinants actually vary by area and age group. The assumption is therefore examined by running separate regressions by urban and rural area and by children aged between 0 to 24 months and those aged between 25 and 60 months.

Noroccidente region	5414	0 195	0 396	0	1
Peten region	5414	0.099	0.299	0	1

Note: Children < 5
Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala, Expanded sample

The children included in the analysis are between 0 and 59 months old. There are about the same number of boys and girls in the sample, and the average age is 29 months. Sahn and Alderman (1997) highlighted the fact that there are cohort-specific differences in how different practices affect nutritional outcomes. Specifically, the impact of household resources, education, and other factors on nutritional outcomes may be hidden and the results may be misleading if heterogeneous age groups are aggregated. Therefore, in examining the determinants of nutrition, we controlled for six different *age groups* (0-6, 7-12, 13-24, 25-36, 37-48, 49-59). We also included *gender* to determine if malnutrition is worse among girls than among boys, which is typical in Asian countries but which, as mentioned before, is not a common pattern in Latin America.

Including *household size* in the model permitted us to assess the extent to which children of larger households are more vulnerable to malnutrition. We also included three other household structure variables in the model. First, we included the *number of children under five years old* to control for the competition among siblings for maternal care and for nurturing time among preschool siblings. Second, we included the *number of women older than 14 years* to account for potential additional attention that children might receive. Third, we included the *headship of the household* variable to explore the hypothesis that children living in households headed by women are better nourished.

The findings of previous studies provide strong evidence on the importance of parents' height on children's growth attainment.[12] In addition to capturing genetic influences, the variable *parents' height* has been interpreted as representing unobserved family background characteristics.[13] Mother's height is expected to have a stronger effect than father's height since the mother is recognized to have an environmental effect through the womb. Household surveys typically collect anthropometric information only about children and mothers and, therefore, only a few studies have also controlled for fathers' height. The ENCOVI/INE 2000 collected information on all household members, meaning that we could include data on the height of both parents in our regression, which allowed us to control for both genetic factors and other human capital and environmental factors.

Many past studies have examined the effect of *parents' educational attainment*, especially the mother's, on children's nutritional status. Dummy variables for either parent having completed primary education are included in our model.

In order to control for the availability of household resources, we included *instrumented per capita household consumption*. We used non-wage income, ownership of household assets, and land as identifying instruments.[14]

The proportion of households with *access to safe water* and *flush toilets* is included to proxy the sanitary conditions of the community in which the child grew up.[15] In urban communities, 50 percent of the

[12] Horton (1986) and Barrera (1990).

[13] Thomas, Strauss, and Henriques (1990).

[14] The predicting equation explains three-quarters of the variation in per capita consumption ($R^2 = 0.74$). The t- statistics for household assets is 36.2, for non-wage income it is 9.5, and for land it is –0 6. Parents' education is also an important predictor of per capita consumption. The results of the first-stage regressions are available upon request from the authors.

[15] Individuals' access to basic services (such as water and sanitation) is not included in the model as it is considered endogenous to nutritional status, in other words, it is believed that parents decide jointly on access to basic services and on their children's

households have flush toilets[16] and 87 percent have piped water (either in the household or outside the household), while less than 1 percent and 50 percent respectively have these amenities in rural areas. The proportion of households that use bottled water is included to account for individuals' awareness of hygienic and sanitation issues as well as for the access of the community to the market distribution system. The proportion of households with *access to private or public garbage collection systems* is also included to reflect the general hygienic conditions of the community. The proportion of households with *a telephone* and *a television* is included to account for the fact that households vary in terms of their access to information. Households' access to health services in the community is approximated by the *travel time to the nearest health center*. Note that in urban areas the average travel time to any health center is 38 minutes, while it is 59 minutes in rural areas. Finally, we included *food prices* because price levels influence the type of products that individuals can afford and, therefore, indirectly affect the population's nutritional status.[17] Due to the fact that there was a lot of missing information on prices at the cluster level[18], we used rural and urban departmental averages. The prices included refer to the most common staples–milk, beans, rice, wheat, cooking oil, and sugar.

The parameter estimates for the different models are reported in Table 1.11.

Table 1.11:Parameter Estimates of Reduced-form Models

Independent Variables	(1) Total	(2) Urban	(3) Rural	(4) < 24 months	(5) > 24 months
Log per capita consumption	0.69317	0 27357	1.19135	0.30365	1 00187
	(7.11)***	(2.16)**	(7.93)***	(1.91)*	(8 18)***
6-11 months	-1 01547	-0.85117	-1 11537	-1 00322	-
	(11 23)***	(5.57)***	(9 85)***	(10 38)***	-
12-23 months	-1 83484	-1.50801	-2.02700	-1 80397	-
	(23 46)***	(11 92)***	(20 26)***	(21 60)***	-
24-35 months	-1.79383	-1.26729	-2.05850	-	0.13613
	(22.97)***	(9.89)***	(20.80)***	-	(2 12)**
36-47 months	-1.93175	-1.50925	-2 15033	-	0 00000
	(24 40)***	(11 34)***	(21.66)***	-	(0.00)***
48-59 months	-1.86781	-1.30637	-2 14750	-	0 03236
	(24.19)***	(10 35)***	(21.82)***	-	(0 51)
Male Dummy	-0 04225	-0.13620	0 01204	-0.05733	-0.03136
	(1.02)	(1.97)**	(0.23)	(0.83)	(0.61)
Household Size	-0 00362	-0 05525	0 02957	-0 02828	0 00906
	(0 27)	(2.29)**	(1.74)*	(1 24)	(0 55)
Number of Kids (<5) in the Household	-0.04627	0 09457	-0.07183	-0.00696	-0 05816
	(1 57)	(1.70)*	(1.98)**	(0.14)	(1 63)
Number of Women >14 in the Household	0 10563	0 12713	0 07510	0 12025	0 10550
	(3 03)***	(2.14)**	(1 68)*	(2 04)**	(2 45)**
Woman Headed Household	0.21049	0 27778	0.05618	-0 06260	0 37629
	(2.46)**	(2 23)**	(0.47)	(0 42)	(3.60)***
Mother Has Completed Primary Education	0 04590	0.32436	-0 02933	0.10764	-0 02921
	(0.89)	(2 99)***	(0.48)	(1.27)	(0 45)
Father Has Completed Primary Education	0.08645	0 20619	0.01506	0 18270	0 03741
	(1.51)	(1.59)	(0 22)	(1 85)*	(0 54)
Mother's Height	0 01509	0 01676	0.01340	0 01778	0 01501
	(6 49)***	(3.33)***	(4.94)***	(3 72)***	(5.76)***

health. Therefore, information on the availability of community-level infrastructure is included, here proxied by the proportion of households in the cluster with access to specific facilities.

[16] Flush toilets were defined as "*inodoro conectado a red de drenaje or a fosa septica,*" in other words, toilets connected to a drainage system or septic tank.

[17] Alderman (2000).

[18] The data are characterized by two levels of sampling: children are grouped within households and households are grouped within clusters, or census-segment Census segments are 50-60 contiguous households, i.e. the amount of work that one census worker can accomplish in the designated period of time.

Father's Height	0.00103	0 00317	-0.00105	0 00025	0 00155
	(2.27)**	(4 80)***	(1 67)*	(0.32)	(2.80)***
Indigenous Mother Speaks Spanish	-0 24665	-0.29121	-0 26497	-0.23774	-0 22586
	(3.31)***	(2.68)***	(2.56)**	(1 93)*	(2 43)**
Indigenous Mother Does Not Speak Spanish	-0.30460	-0 27612	-0 26616	-0 16726	-0 37572
	(4.90)***	(2.21)**	(3.51)***	(1 59)	(4 91)***
Urban Dummy	-0 14848	-2 49220	0.00000	-0 19293	-0.12713
	(2.00)**	(1.32)	(0 00)***	(1 56)	(1.38)
Proportion of Families with Bottled Water	0.20226	0.38155	0.19361	0 50462	0 00000
	(1 26)	(1.96)**	(0 67)	(1 83)*	(0 00)
Proportion of Families with Propane	0 16391	0.28704	0.04793	0 19610	0 10717
	(2.49)**	(0.99)	(0.63)	(1 79)*	(1 31)
Proportion of Families with Electricity	-0.12197	-0.40228	-0.14200	-0 01375	-0.18701
	(1.86)*	(0 61)	(1.97)**	(0.13)	(2 28)**
Proportion of Fam. with Smoke Escape (if Use Wood)	-0.10148	0.00987	-0.11958	0 09530	-0.17055
	(0.83)	(0 03)	(0 80)	(0.45)	(1.14)
Proportion of Fam w/o Smoke Escape (if Use Wood)	0 10222	0 06600	0 13277	0 27161	-0.01447
	(0 94)	(0.31)	(0.95)	(1.51)	(0.11)
Proportion of Families with Piped Water	0.01811	0.45983	-0 01171	0.08544	-0.03309
	(0.28)	(2.69)***	(0 16)	(0 80)	(0 41)
Proportion of Families with Toilet in the House	0.04172	-0 27286	0.14485	-0 22228	0 26342
	(0.35)	(1.80)*	(0.61)	(1 12)	(1 74)*
Proportion of Families with Fixed Telephone	0 09679	0.32968	0.00537	0 05573	0.10959
	(0.53)	(1 62)	(0.01)	(0.19)	(0.48)
Proportion of Fam. using Garbage Collection	-0 01029	0.04811	-0.43885	0 51495	-0 39854
	(0 08)	(0.31)	(1 31)	(2.35)**	(2.40)**
Proportion of Families with Tv	0.12864	0.35413	-0.03723	0.13261	0 05873
	(1.02)	(1 53)	(0 22)	(0.63)	(0.38)
Average Quotation of Milk Price	-0 02646	-0 01623	-0.04556	-0 03328	-0 02606
	(1.29)	(0 45)	(1 76)*	(1.03)	(0 99)
Average Quotation of Rice Price	-0 19462	-0 51298	-0 00344	-0 28292	-0 14472
	(1.79)*	(2.63)***	(0 03)	(1.63)	(1 04)
Average Quotation of Beans Price	-0 08362	0.20631	-0 14327	-0.19851	-0.02689
	(1.22)	(1.47)	(1.71)*	(1 72)*	(0 32)
Average Quotation of Wheat Price	0 14316	0 38412	-0.02982	0 30488	0 05637
	(1.61)	(2.27)**	(0.25)	(1.92)*	(0 53)
Average Quotation of Sugar Price	-0.20374	-1.83935	0.23321	0.30705	-0 68803
	(0.78)	(3.39)***	(0.74)	(0.70)	(2 11)**
Average Quotation of Vegetable Oil Price	-0.01003	-0 01715	-0 01948	-0.02687	-0 01150
	(0.41)	(0.34)	(0 64)	(0.65)	(0 38)
Average Travel Time to Health Facilities	0.00063	-0 00032	0.00052	0 00110	0 00006
	(0.89)	(0.18)	(0.64)	(0 91)	(0.07)
Norte region	0 70615	0 73045	0 46470	0 88232	0 52181
	(5.93)***	(3.41)***	(2 34)**	(4 56)***	(3.47)***
Nororiente region	0 64318	0.52651	0.41698	0 80086	0 49146
	(6 22)***	(2.92)***	(2 29)**	(4 66)***	(3 79)***
Suroriente region	0.42287	0.32302	0.27281	0 44567	0.35864
	(3.86)***	(1.73)*	(1.44)	(2.45)**	(2 63)***
Central region	0.30171	0 01308	0 14237	0 27839	0.27682
	(3.15)***	(0.10)	(0 78)	(1.75)*	(2.33)**
Suroccidente region	0.27316	-0.03070	0 11917	0 36594	0 13243
	(2.61)***	(0 21)	(0 62)	(2.08)**	(1 02)
Noroccidente region	0 27126	0.25159	0.03067	0.34802	0 16527
	(2.49)**	(1.34)	(0.16)	(1.94)*	(1.21)
Peten region	0.77960	1.00927	0 38877	1 06978	0.54033
	(5.63)***	(3 91)***	(1.78)*	(4 70)***	(3 12)***
Constant	-7.17773	0.00000	-10.60430	-5 08103	-10 58764
	(6.78)***	(0.00)***	(6 95)***	(2 95)***	(7.94)***
Observations	4723	1737	2986	1953	2770
R-squared	0.28	0.26	0 28	0.28	0 23

Note: Absolute value of t-statistics in parentheses; * significant at 5% level; ** significant at 5% level, *** significant at 1% level*

Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

In all of our models, chronic malnutrition worsens as the child gets older up to the age of five, and the decline in the z-score is worse in rural areas than in urban areas. Another feature of these models is that the presence and number of women older than 14 years old in a household is associated with taller children, confirming the importance of additional care and attention for children's health. Finally, per

capita (predicted) consumption has a very significant and positive effect on children's nutritional status, signaling the importance of the availability of resources and confirming the strict relationship between poverty and malnutrition.

Indigenous children are significantly smaller than non-indigenous children, even after controlling for income, education, and infrastructure, all of which the indigenous population has less of than the non-indigenous population. Large differentials in chronic malnutrition by ethnicity may reflect social exclusion or other forms of differential access to services that are not captured in this model.[19] Moreover, the ability of indigenous women to speak Spanish is associated with better nutritional outcomes for their children. Not being able to speak Spanish often precludes indigenous families from using health facilities as, in some health centers, nurses and doctors do not speak any language but Spanish.[20]

There is a strong relationship between a mother's height and that of her child. As expected, the influence of a father's height is significant but is less than the influence of the mother's height because of the mother's additional effect on her children's nutritional status through the womb.

The distance to the nearest health facility is also included to measure access to health care services. However, this variable does not capture the quality of such services, which might explain its lack of explanatory power.

Note that when the effect of most exogenous variables is controlled for, living in the Metropolitan region (the excluded regional dummy) is not associated with better nutritional outcomes.

Some coefficients differ by age group and by geographical area. For example, having access to a flush toilet[21] has a significant positive effect on the nutritional outcome of older children but has no significant impact on children younger than two years old. A possible explanation is that little children do not use toilets very much, and therefore their growth patterns are not likely to be affected by the presence of a flush toilet in the household.

Parental education has a positive and significant effect on children's nutritional status. On the one hand, education helps parents' (especially mothers') to understand how to manage nutrition, disease, and sanitation most effectively. On the other hand, education influences other socioeconomic characteristics like the age at which women marry, the number of children they have, and their status within the community. Different patterns are observed for mothers and fathers when exogenous factors are controlled for. In urban areas, children of educated mothers have a significantly better growth pattern than children of mothers with no schooling, while in rural areas education seems not to matter as much as other factors such as income or the presence of women in the household. There are significant differences in growth patterns between young children of educated fathers and children of fathers with no education.

No gender bias is observed apart from in urban areas where boys have worse nutritional outcomes than girls. This may be explained by the fact that, in urban areas, more boys than girls work outside the home, and working children no only have higher nutritional needs but they are also away from home where they have access to food, for most of the day. The absence of any significant gender effect is consistent with findings for other Latin American countries and, in general, for all countries except those in the Asian region.

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[19] See Part II for an analysis of the nutritional gap between indigenous and non-indigenous children.

[20] See QPES, section 5 on Basic Services, "Percepciones de Servicios e Infraestructura Gubernamentales."

[21] Flush toilet was defined as "*inodoro conectado a red de drenaje*" or "*inodoro conectado a fosa septica* "

In urban areas, large households negatively affect children's long-term nutritional status, while in rural areas, it is specifically the number of children in the household that has a negative effect on children's height. The parents' attention matters more for older children for whom living in a household headed by a woman has a positive influence.

The proportion of households with access to piped water is positively correlated with long-term improvements in nutritional status in urban areas, while it has no effect in rural areas. The combination of the positive effect of being connected to piped water with the negative effect of bad water quality may explain the lack of significance of having piped water in rural area. There is evidence that, when the connection to piped water is established, individuals immediately stop treating the water, because they associate the new piped water connection with safe and drinkable water, which is not often the case. The proportion of households using bottled water is positively associated with growth in children's height in urban areas and in the case of older children. A limited distribution system in rural areas and the limited access that rural dwellers have to marketed goods may explain why bottled water has no effect on people living in rural areas. At the same time, prolonged breastfeeding prevents younger children from being affected one way or the other by the use of bottled water.

Indigenous children are significantly more malnourished than non-indigenous children. Indigenous children have a variety of characteristics that may lower their height relative to non-indigenous children, in particular the fact that they tend to live in low-income households but also they tend to live in rural areas and have less-educated parents, for example. Even after controlling for income and other household and individual characteristics, ethnicity is still an important determinant of child growth attainment.

The difference in stunting rates between indigenous and non-indigenous children can, therefore, reflect differences in their endowments but also differences in their access to services (exclusion), discrimination, and unobserved factors. Here we use the Oaxaca-Blinder technique to determine the proportion of the nutrition gap in height-for-age z scores that is due to the two potential sources–endowments and unobserved factors including discrimination. Using the Oaxaca decomposition, the difference between average z scores for indigenous and non-indigenous children can be decomposed as follows:

$$HAZi - HAZni = [(Bi - Bni)*Xni] + [Bi*(Xi - Xni)].$$

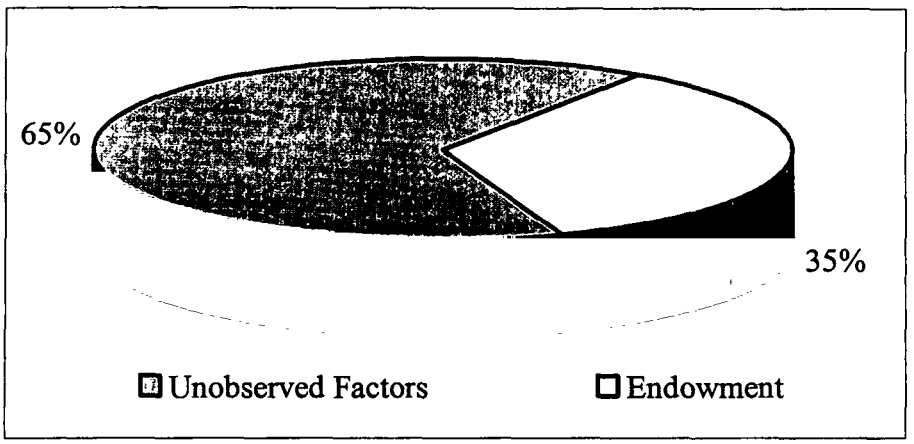
The first term on the right-hand side is the difference in the value of endowments between indigenous and non-indigenous children multiplied by the average endowment of non-indigenous children. It represents the "unexplained" difference in malnutrition, which in part can be interpreted as evidence of discrimination. The second term is the difference in the average levels of human capital and other endowments between indigenous and non-indigenous children, multiplied by the value of one unit of X for indigenous children. This portion is normally referred to as the "explained" difference or difference in endowments.[22]

Our analysis of the z-score differential in Guatemala using the Oaxaca decomposition reveals that there was a significant gap in children's malnutrition in 2000. Thirty-five percent of this nutritional gap is explained by the different characteristics of indigenous and non-indigenous children and their households, and the remaining 65 percent is due to unobserved characteristics, including discrimination. The results are very different if different weights are employed, in other words, the difference in endowment explains 89 percent of the nutritional differential when the non-indigenous coefficients are used instead of the

[22] The Oaxaca decomposition is a valuable and easy tool, but it has some limitations and the results must therefore be interpreted carefully. Omitting some relevant variables could yield an underestimation of the portion of the gap that is due to difference in endowments.

indigenous ones.[23] The selection of weights is somehow arbitrary, and it is, therefore, legitimate to enquire whether there is any specific reason to emphasize one result over the other. From a policy perspective, it is probably more interesting to use the indigenous coefficients and to pose the following question: how would indigenous malnutrition change if indigenous children had the same endowments as non-indigenous children but kept their own functions, in other words, their own rate of return to the endowments? According to the results above, even if policymakers were successful in eliminating the disadvantages of indigenous children with respect to non-indigenous children, 65 percent of the gap in growth achievement would still remain.

Figure 1.4: Decomposition of the Nutritional Gap between Indigenous and Non-indigenous Children



Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala.

Proximate Determinants. The proximate determinants of child nutrition (feeding practices, birth order, and household environment) are decisions made by the household in which the child lives. Thus, they should be included in a multivariate regression analysis only with great care because, when choice variables are added in the model without further control, biased estimates are produced. Therefore, we analyzed proximate determinants separately, by looking at their cross-correlation with the malnutrition indexes.

[23] That is, using the following decomposition: $HAZ_i - HAZni = [(Bi - Bni)*Xi] + [Bni*(X_i - Xni)]$

Table 1.12: Proximate Determinants - Descriptive Statistics

	Summary Statistics
MATERNAL FACTORS	
Maternal Age at Birth	
Mean (years)	26.5
Standard Deviation (years)	6.8
Maternal age less than 18 years (%cases)	6.0%
Birth Order	
Preceding Birth Interval	
Mean (months)	38.7
Standard Deviation (months)	28.8
Birth Order	
Mean	3.2
Standard Deviation	2.0
First (%cases)	22.0%
2-4 short (%cases)	3.5%
2-4 medium (%cases)	19.0%
2-4 long (%cases)	29.0%
5+ short (%cases)	2.0%
5+ medium (%cases)	10.0%
5+ long (%cases)	12.0%
ENVIRONMENTAL FACTORS	
Flush Toilet in the hh (% hh)	19.0%
Piped Water in the hh (% hh)	60.0%
Use of Garbage Collection Systems (% hh)	15.0%
Use of Bottled Water (% hh)	31.0%
Availability of propane (% hh)	66.0%
NUTRITION FACTORS	
Birthweight	
Mean (kg)	3.3
Standard Deviation (kg)	1.9
Low Birth Weight (<2.5 kg)	8.0%
Breastfeeding	
Median (months)	16.0
Breastfeeding Index	
Mean	0.8
Standard Deviation	0.3
PERSONAL ILLNESS HISTORY	
Had Diarrhea (%cases)	34.0%
Had Respiratory Infections (%cases)	49.0%

Source. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 1.13 presents our findings on the significance of the relationship between stunting rates and different categories of proximate determinants.

Table 1.13: Relationship between Stunting Rates and Proximate Determinants

	Average Stunting Rate		Difference
	Dummy = 1	Dummy = 0	Significant
MATERNAL FACTORS			
Maternal Age <=18	51.1	45.0	**
Birth Order			
First	39.4	47.8	***
2-4 short	48.6	45.8	-
2-4 medium	51.6	44.6	-
2-4 long	39.3	48.6	-
5+ short	67.2	45.5	-
5+ medium	57.4	44.7	-
5+ long	50.3	45.3	**
ENVIRONMENTAL FACTORS			
Exposure to Infectious Agents			
Flush Toilet in the hh	23.4	49.7	***
Piped Water in the hh	40.4	50.1	***
Use of Garbage Collection Systems	21.6	48.3	***
Use of Bottled Water	21.8	47.1	***
Availability of propane	36.5	59.1	***
Availability of electricity	41.7	52.2	***
Communication			
Telephone in the hh	25.8	50.6	***
TV in the hh	40.1	58.8	***
NUTRITION FACTORS			
Low Birthweight	53.6	43.8	**
PERSONAL ILLNESS HISTORY			
Had Diarrhea	50.0	43.4	***
Had Respiratory Infections	48.3	43.1	**
Has vaccination card	45.7	45.4	

Note Children < 5
Significance at 10%, ** Significance at 5%, * Significance at 1%.*
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala.

There is considerable evidence that childbearing at young and relatively old (above 40) ages has deleterious consequences for children's health and survival. We compared the stunting rates of children whose mothers were younger than 18 years old at the time of giving birth to the stunting rates of children of older mothers. The results in Table 1.13 show that there is a considerably significant effect on the prevalence of chronic malnutrition (5 percentage points) associated with mother's young age.

It has also been firmly established that children's health is worse (and child mortality is higher) in the case of births spaced at short intervals and of high parity births. Short birth intervals may lead to worse health and nutrition outcomes through maternal depletion, greater competition between siblings for household resources and their parents' attention, and increased transmission of infection among siblings.[24]

[24] Pebley and Stupp (1987).

We modeled birth spacing and parity in seven categories. First, we distinguished the number of births into two categories–from two to four children and five or more children. Within these two groups, we further classified children in terms of the length of time between their births and the birth of the sibling born immediately before them. We specified short, medium, and long intervals and defined them as representing 14 months or less, 15-29 months, and 30 months or more respectively. The data in Table 1.13 show that malnutrition increases monotonically with the child's birth order in the family and is worse in the case of short birth intervals.

Five characteristics of the household are assumed to affect its hygienic and sanitary characteristics and to influence the likelihood of transmission of infectious diseases, both directly and indirectly. There five characteristics are: the availability of piped water, the availability of a flush toilet, the availability of propane,[25] the use of garbage collection systems, and the use of bottled water. Table 1.12 lists the household conditions that facilitate the transmission of infectious diseases. Less than 20 percent and 15 percent of children live in households with flush toilets and with garbage collection systems respectively. About 30 percent of children live in households where bottled water is used as the source of drinking water. Children living in households with better environmental factors have significantly better growth patterns.

Birth weight provides information on the adequacy of a mother's nutrient intake during her pregnancy. Infants with low birth weights generally have low stores of nutrients like iron, fat, and vitamin A and are, therefore, more likely than bigger babies to be malnourished later in life. Information on birth weight needs to be used with care since the birth weights reported in ENCOVI/INE 2000 are not derived from actual measurements but from the mothers' recollection. Moreover, birth weight information in the ENCOVI/INE survey was collected only for each mother's most recent birth. Therefore, the sample used to assess the relationship between birth weight and stunting is smaller (3,112 observations) than the sample used to assess the impact of other proximate determinants (5,414 observations). Nevertheless, the average prevalence of malnutrition in children with low birth weights is significantly higher (54 percent) than malnutrition in children with normal birth weights (44 percent). There is evidence that some indigenous women in Guatemala try to control their weight gain during pregnancy, believing that a smaller baby will reduce the risk of complications during delivery and, therefore, the need to go to a "cold and impersonal place" like they perceive the hospital to be.[26]

Several studies have analyzed the impact of different breastfeeding patterns on the nutritional status of children and infants.[27] Exclusively breastfeeding for at least the first six months of a baby's life provides them with an adequate source of nutrients and antibodies and eliminates the chance that the baby will fall ill as a result of using infected utensils to prepare formula. Moreover, in a country where contraceptive use is as low as in Guatemala, breastfeeding plays a major role in lengthening birth intervals by extending the duration of post-partum amenorrhoea. On the other side, excessively prolonged breastfeeding can be dangerous for the growth and development of the child as it can lead to some micronutrient deficiency and growth faltering.[28] A number of studies carried out in Africa, Latin America, and Asia have reported an association between prolonged breastfeeding (more than 12 months) and an increased risk of height-for-age deficits.[29] Victora et al (1984) found, after controlling for possible confounding variables, that

[25] Propane is used mostly for cooking in gas stoves (although some people also use it to warm up water). Therefore, it is a substitute for fuelwood, but it is also a better technology because it is cleaner and more efficient.

[26] Solares (1997).

[27] Barrera (1990) and IFPRI (2000).

[28] WHO Note for the Press (2001). On the internet at: http://www.who.int/inf-pr-2001/en/note2001-07.html, American Academy of Pediatrics, 1997.

[29] Martorell, Leslie, and Moock (1984) and Brakohiapa et al (1988).

Brazilian children who were breastfed for three to six months tended to have a better nutritional status (measured in terms of both height-for-age and weight-for-height) than those who were breastfed for either shorter or longer periods. As possible explanations for this, they suggested: (i) that poorly nourished mothers in developing countries produce milk with a low fat content that provides less energy per unit than milk from better nourished women; (ii) that mothers who breastfeed for long periods may be giving the child inadequate supplementary foods; and (iii) frequent breastfeeding may also reduce the baby's appetite. Selection effects may also be important, since some mothers may breastfeed longer when their children are shorter or thinner than average.

We used an index of breastfeeding duration to compare the length of time a child was breastfed with his/her age and with the median time for breastfeeding in Guatemala. Breastfeeding is almost universal and prolonged in Guatemala. The median duration of breastfeeding in the ENCOVI sample is 16 months.[30] The breastfeeding duration index ranges from zero to one and equals either the ratio of the length of breastfeeding and 16 if the child is at least 16 months old at the time of the respondent's interview[31] or the ratio between the length of breastfeeding and the child's age if the child is less than 16 months at the time of the interview. The mean value of the index is 0.78. Table 1.14 shows that the breastfeeding index monotonically decreases with higher per capita consumption and with the mother's education level. It is higher in rural areas, for indigenous women, and for women who do not speak Spanish.

[30] Trussell et al (1992), using data from the 1987 Guatemalan DHS, estimated the trimean of breastfeeding duration to be 19.6 months with current-status data and 18.1 with retrospective data. If Q_1, Q_2, and Q_3 are the ages at which 25 percent, 50 percent, and 75 percent of women are no longer breastfeeding, the trimean is calculated as $(Q_1 + 2Q_2 + Q_3)/4$.

[31] The index takes the value of one if the child was breastfed for longer than 16 months.

Table 1.14: Breastfeeding Index by Consumption Quintile

	BFI
Quintile	
Q1	0.84
Q2	0.80
Q3	0.79
Q4	0.74
Q5	0.64
Area	
Urban	0.73
Rural	0.81
Ethnicity	
Indigenous	0.84
Non-indigenous	0.73
Mother's Education	
No Education	0.83
Preparatory School	0.77
Primary School	0.77
Middle School	0.68
More than Middle School	0.67
Mother's Ability to Speak Spanish	
Mother Speaks Spanish	0.75
Mother does not Speak Spanish	0.85

Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala.

The ENCOVI collected information about episodes of diarrhea and acute respiratory infections in the month prior to the survey of every child.[32] About one-third of the children had diarrhea, while almost one-half of them suffered from acute respiratory infections.

Both the duration and frequency of infectious diseases affect children's nutritional status by suppressing their appetites and by interfering with their nutrient absorption, utilization, and requirement through energy lost as heat during fever, in sweat or vomiting, and protein catabolism.[33]

Diarrheal diseases affect the health status of infants and children in developing countries more than any other infant and child infection.[34] Diarrhea causes food to pass through the intestine too quickly to be absorbed. Epidemiological data indicate that diarrheal diseases occur with greater frequency during the period of weaning and that exposure to infection occurs largely through fecal contamination.[35]

The consequences of respiratory infections on children's growth are less clear. Martorell and Yarbrough (1983) found upper tract respiratory infections to be negatively associated with growth velocities in children only in one of seven studies carried out in Africa and Latin America. A longitudinal study of 5,914 children conducted in Brazil between 1982 and 1986 revealed that, although severe respiratory infections had a negative impact on growth, hospital admissions for diarrhea were more strongly associated with subsequent malnutrition than were admissions for pneumonia. At the same time, however,

[32] The ENCOVI collected no information on accidents and injuries.

[33] Rohde (1986) and Victora et al (1986).

[34] Chen and Scrimshaw (1983)

[35] Pebley, Hurtado and Goldman (1999).

malnutrition was a more important risk factor for pneumonia than it was for diarrhea. All of the associations were stronger in the first two years of life than at older ages.[36]

The prevalence of chronic malnutrition was significantly higher among children who had diarrhea (50 percent) or acute respiratory infections (48 percent) in the two weeks prior to the survey than among those who did not have such infections (44 percent and 43 percent respectively).

Micronutrients

Micronutrient deficiency is another aspect of the poor nutritional status of the Guatemalan population and is an enormous barrier to the country's socioeconomic development. Its negative effects on health, learning ability, and productivity contribute to a vicious circle of underdevelopment and worsen the conditions of groups that are already disadvantaged.

The micronutrients analyzed in this section are vitamin A, iron, iodine, folic acid, and other vitamin B components (other than folic acid). Such nutrients are generally absent or only present in very low quantities in any diet based on cereals and limited animal products as is the norm in Guatemala. We start this section by describing the state of micronutrient deficiency among adults and children and then present an overview of the most important micronutrient fortification programs in the country.

Poverty, a lack of variation in most people's diets, a lack of knowledge about optimal dietary patterns, and a high incidence of infectious diseases are among the most important factors that lead to micronutrient malnutrition.

Characteristics and Patterns. Table 1.15 illustrates the state of the population's deficiencies in selected micronutrients in Guatemala and in the other Central American countries. Guatemala stands out as the poorest performer among all countries. There is very little supplementation of iodine through salt and of folic acid through wheat flour in Guatemala (see below). Moreover, the percentage of women affected by anemia is the second highest in the region. Finally, the percentage of cases of sugar found with low content of vitamin A (below 20 μg/dL) is the lowest before fortification but the highest after fortification.

Table 1.15: Micronutrient Levels in Guatemala and in Central America

	Iodine* (μg/L)			Folic Acid (in wheat flour)	Anemia	Vitamin A (% cases with < 20 μg/dL)	
	Min	Median	Max	% of RDI**	Women, % cases	Before sugar Fortification	After sugar Fortification
Guatemala	16	72	162	5	35 (1995)	26	16
El Salvador	48	251	312	20	16 (1998)	36	5
Honduras	40	240	414	18	26 (1996)	38	14
Nicaragua	88	115	138	9	25 (2000)	31	9
Costa Rica	100	233	500	26	19 (1996)	-	9
Panama	50	270	500	15	40 (1999)	-	9

** Non-representative sample for all countries but for Panama and Costa Rica. ** Recommended Daily Intake Source. UNICEF (2001).*

Table 1.16 shows the results of a study carried out by UNICEF and CONAPLAN (the National Planning Council) in 1999. Only 16 percent of the children surveyed meet the daily caloric requirement. Moreover, 18 percent of them are highly deficient in terms of micronutrients (less than 50 percent of the total requirement). A high percentage of children (57 percent) was found to be in an intermediate condition (in

[36] Victora et al, 1990

other words, receiving only 50 to 75 percent of the caloric requirement), which could be improved by a higher caloric intake. Unfortunately, the data in this study was not sufficient to allow us to disaggregate the findings by area and socioeconomic status, which would have enabled us to identify the most vulnerable groups in the population.

About a third of the infants sampled were found to have an adequate protein intake. However, 12 percent of the population sampled did not even reach 50 percent of the recommended requirement.

Most of the children met the adequate requirements for vitamin A, and only 2 percent of them had a severe deficiency. This positive outcome seems to be related to the successful program of vitamin A fortification of sugar that Guatemala has undertaken over the last decades (see below). The same study revealed that sugar is the product that is most consumed (in terms of frequency) by children.

Only 2 percent of sampled children had diets that met the requirement for iron. Guatemalan people tend to eat citric products (which help people to absorb inorganic iron) only in very limited quantities, but they consume large quantities of foods that tend to reduce the absorption of iron, such as cereals, legumes, coffee, and broth made with black beans.

Table 1.16: Percentage Adjustment in Accordance with Requirements - Children Younger than One Year Old

Fulfillment of Requirements	Energy (Kcal)	Proteins	Vitamin A*	Iron
>100%	16%	35%	66%	2%
75-100%	8%	38%	29%	0%
50-75%	57%	15%	3%	3%
<50%	18%	12%	2%	95%
<25%	-	-	-	34%
Sample size	352	352	352	352

** Taking into account fortified sugar.*
Source: UNICEF, 2000, Avances en el Cumplimento de las Metas de Cumbre Mundial en Favor de la Infancia.

A Review of Government Programs. Although Guatemala was the pioneer of most micronutrient fortification programs in Central America, it is one of the poorest performers in terms of their success.

A program to fortify sugar with Vitamin A was originally introduced in 1975 in Guatemala, only to be suspended two years later. In 1987-88, the program was re-introduced, and since then, it has been maintained without interruption. Currently, the government's annual investment in sugar fortification amounts to 25 million Quetzals per year. According tothe Instituto de Nutrición de Centro América y Panamá (INCAP) this is one of the most successful micronutrient fortification programs in Guatemala, with 99 percent of the households that received fortified sugar and 79 percent of households showing an average prevalence of Vitamin A above 5mg/kg in 2000[37] Unfortunately, the only "national" impact evaluation exercise of this program to be undertaken was carried out in 1995 when Guatemala's Vitamin A deficiency levels were estimated to be the highest in Central America. Moreover, according to a UNICEF/CONAPLAN report,[38] an evaluation of direct supplementation of Vitamin A to mothers with infants younger than six months old showed that fewer than 10 percent of children and 1 percent of mothers had received supplements of Vitamin A.

[37] INCAP/OPS (2000).

[38] UNICEF/CONAPLAM (2000).

At the time of writing, news has spread about a possible suspension of the sugar fortification program due to a dispute between sugar producers and the government.[39] The government's decision to let imports of unfortified sugar enter the country (the fortification requirement, previously required for all sugar imports, is now applied only before the sugar is commercialized) upset sugar producers who are now consulting with the government to decide on future action.

Despite the fact that Guatemala was one of the first developing countries to introduce a program that fortified salt with iodine in 1959, the program has failed to in terms of ensuring that the population has an adequate intake of iodine. As a result, today, after 40 years, diseases related to iodine deficiency continue to be a serious public health problem in Guatemala. The Department of Regulation and Control of Food in Guatemala has recently analyzed private spending on the major brands of salt bought by Guatemalans.[40] Only 22 percent of the brands that were analyzed held a Sanitary License and, more importantly, only 25 percent of them had an iodine concentration in accordance with the international regulation (30-100 mg/kg). Most alarming is the fact that iodized salt is the only source of iodine in the Guatemalan diet.

Table 1.17 presents data collected from INCAP that highlight the poor performance of Guatemala in terms of iodine fortification compared to other Central American countries. Not only does almost half of the population not seem to receive the micronutrient but also the quality of supplemented iodine is very lo; an average iodine concentration greater than the recommended 30 mg/KG was found only in 20 percent of the cases.

Table 1.17: Coverage and Efficiency of Iodine Supplementation in Guatemala

	Coverage (% of Population)	Efficiency (iodine>= 30mg/Kg)
Guatemala	55	20
Honduras	87	80
Nicaragua	96	61
El Salvador	98	88
Costa Rica	100	89
Panamá	100	99

Source INCAP/OPS (2000)

Guatemala was also one of the first Central American countries to fortify wheat flour with iron and Vitamin B (thiamin, riboflavin, and niacin). In 1992, together with El Salvador, Guatemala also began to add folic acid to wheat flour and stood out as one of the first countries in the world to recognize the importance of this micronutrient to human health. Nevertheless, the fortification of flour with folic acid is still insufficient. Women in Guatemala are receiving only 5 percent of their recommended daily intake, and the amount added to flour has not yet been increased according to the 2001 regulation. On the other side, according to data from INCAP, the fortification of wheat flour with iron and Vitamin B seems to have been successful. In 2000, INCAP and the Organización Panamericana de la Salud (OPS) together with the Department of Food Control in the Ministry of Health carried out an inspection of the wheat mills in Guatemala and found that they were complying with the fortification requirements (the average content of iron was 71 mg/kg). However, the successful iron supplementation of wheat flour is still not enough to make up the iron deficiencies of the Guatemalan population, especially of women who have the

[39] Prensa Libre, September 10, 2001: "Azucar: Inversion en Riesgo", available on line at: http://www.prensalibre.com/pls/prensa/prensa.pl_crp_pag.pagina?p_fedicion=10-sep-01&p_cseccion=nego&p_forma=4&p_cnoticia=11382

[40] INCAP/OPS and UNICEF (2000)

highest rates of anemia in the Central American region. The sources of anemia are manifold, but a lack of iron is typically one of the most important. Therefore, it is crucial for policymakers to consider adding iron to other important products in the Guatemalan diet.

II: Adult Malnutrition in Guatemala

The ENCOVI/INE 2000 collected anthropometric information for all individuals in the surveyed households, therefore making it possible to study the growth attainment of the entire Guatemalan population. This section focuses on adults only (in other words, individuals older than 18) since there is no consensus on which indicator should be used to assess growth attainment among adolescents. Adolescence is a very complex transition period during which children become adults and experience rapid hormonal changes that accelerate growth in height. The variability of the timing of both the beginning and the end of puberty makes it difficult to develop charts of expected growth patterns.

The Body Mass Index (BMI), an indicator of thinness, is used as the preferred indicator of adult nutritional status. As discussed in Appendix 1, BMI is associated mainly with adequate nutritional status rather than with the composite interaction of feeding practices, morbidity history, and other factors that influence children's growth as proxied by height-for-age. Nutritional data on adults are very scarce, and most surveys collect anthropometric information only on children and women. For this reason, international comparisons of adult growth patterns are limited to samples of women.

Table 2.1 shows trends in adult malnutrition for women in different Latin American countries during the last decade. Contrary to the declining trends observed in the majority of Latin American countries, malnutrition among women in Guatemala has worsened over time, increasing from 24 percent in 1995 to 26 percent in 2000. Under-nutrition among women is of particular concern because of its potential consequences for their babies, including low birth weight and infant mortality.

Table 2.1: Malnutrition Prevalence among Women –Latin American and the Caribbean

	BMI mean	Standard deviation	12.0-15.9 (Severe)	16.0-16.9 (Moderate)	17.0-18.4 (Mild)	Number of women
Dominican Republic 1991	23.2	4.6	0.7	1.9	6.2	1990
Dominican Republic 1996	24.2	4.3	0.5	0.7	4.9	2492
Haiti 1994	21.2	3.4	2.1	3.5	13.1	1816
Guatemala 1995	**24.2**	**4.1**	**0.3**	**0.5**	**2.9**	**4484**
Guatemala 1999	**25.0**	**4.4**	**0.3**	**0.2**	**1.5**	**2199**
Guatemala 2000 *	**25.5**	**4.8**	**0.4**	**0.6**	**2.2**	**8208**
Nicaragua 1997	24.7	4.5	0.1	0.4	3.3	4793
Bolivia 1994	24.3	3.7	0.2	0.3	1.9	2222
Bolivia 1998	25.3	4.0	0.0	0.3	0.6	3857
Brazil 1996	24.0	4.4	0.3	1.0	4.9	2949
Colombia 1995	24.5	4.0	0.1	0.5	3.2	3156
Colombia 2000	24.7	4.0	0.2	0.4	2.5	3070
Peru 1992	24.8	3.8	0.1	0.1	1.0	4630
Peru 1996	25.1	3.8	0.0	0.0	0.5	9600
Peru 2000	25.4	3.9	-	0.1	0.6	8372

** Outliers (bmi<=12 \| bmi>=50) are excluded in the ENCOVI 2000 sample.*

Sources: DHS and World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala, for latest observation on Guatemala (2000).

Table 2.2 presents the distribution of BMI for adult males and females in urban and rural areas and among indigenous and non-indigenous groups disaggregated by consumption quintiles. Urban adults tend to be fatter than rural individuals regardless of their economic status. There is no significant difference in average BMI between indigenous and non-indigenous people. On average, increased total consumption is associated with higher BMIs.

Table 2.2: Average Body Mass Indices by Consumption Quintiles

Mean BMI	Male				Female			
	Urban	Rural	Indigenous	Non-indigenous	Urban	Rural	Indigenous	Non-indigenous
Total	25.3	23.4	23.7	24.5	26.4	24.8	24.8	25.9
Quintile								
Q1	23.2	22.6	22.8	22.2	24.4	23.4	23.6	23.3
Q2	24.5	23.1	23.4	23.1	25.7	24.2	24.4	24.6
Q3	24.2	23.6	23.9	23.7	26.0	24.8	25.1	25.3
Q4	25.0	23.8	24.3	24.5	26.6	26.2	26.1	26.5
Q5	26.0	24.6	25.1	25.8	26.7	27.2	26.8	26.8

Note Individuals older than 18, non-pregnant women
Source. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 2.3 presents data on the prevalence of moderate, mild, and severe adult malnutrition for the Guatemalan population by area of residence and by consumption quintiles, based on the WHO Expert Committee classification.[41] Contrary to what we observed among children, adult under-nutrition does not constitute a serious concern in Guatemala. Less than 1 percent of adults are classified as severely or moderately malnourished, while 2 percent are mildly malnourished.[42] No specific trend can be observed across consumption quintiles. One possible explanation of such a low under-nutrition rate among adults may be the high prevalence of stunting; only a few women would have a BMI lower than 18.5 (the denominator in the BMI, squared meters, is very low).

Table 2.3: The Prevalence of Adult Malnutrition by Consumption Quintiles

	Total	Q1	Q2	Q3	Q4	Q5
Male						
Mild	1.9	2.8	1.9	1.5	1.9	1.4
Moderate	0.2	0.4	-	0.2	0.4	0.2
Severe	0.2	0.2	0.3	0.1	0.2	0.2
Female						
Mild	2.1	2.7	1.9	3.5	1.8	0.9
Moderate	0.5	0.1	1.0	0.9	0.5	0 2
Severe	0.4	0.2	0.5	0.6	0.2	0.4

Note: Individuals older than 18, non pregnant women
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Adult "mild malnutrition" is twice as high among extremely poor adults (3.2 percent for males and 2.6 percent for females) as among non-poor adults (1.6 percent for males and 1.5 percent for females). Moderate and severe malnutrition, on the other hand, do not vary significantly with poverty status (Table 2.4).

[41] See Part III for definitions of adult malnutrition.

[42] A prevalence of the population with a BMI less than 18.5 percent around 5 to 9 percent is a warning signal of a situation that requires some monitoring.

Table 2.4: The Prevalence of Adult Malnutrition by Poverty Status

	Total	Non Poor	Poor	Extemely Poor
Male				
Mild	1.9	1.6	2.2	3.1
Moderate	0.2	0.3	0.2	0.3
Severe	0.2	0.2	0.2	-
Female				
Mild	2.1	1.5	2.7	2.8
Moderate	0.5	0.3	0.7	0.2
Severe	0.4	0.4	0.4	0.3

Note: Individuals older than 18, non pregnant women.
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Finally, the prevalence of malnutrition among adults is higher in rural areas than in urban areas and higher among non-indigenous people than indigenous people (Table 2.5).

Table 2.5: The Prevalence of Adult Malnutrition by Area and Ethnicity

	Total	Urban	Rural	Indigenous	Non-indigenous
Male					
Mild	1.9	1.1	2.4	1.5	2.1
Moderate	0.2	0.3	0.2	0.1	0.3
Severe	0.2	0.1	0.3	0.1	0.2
Female					
Mild	2.1	1.6	2.4	1.9	2.2
Moderate	0.5	0.3	0.6	0.3	0.7
Severe	0.4	0.3	0.4	0.4	0.4

Note. Individuals older than 18, non-pregnant women.
Source. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

III: Over-nutrition and Obesity

Under-nutrition among children remains the greatest nutrition problem in Guatemala. However, there is evidence that over-nutrition and obesity are increasing among both children and adults. Diet and lifestyles have been changing considerably in Guatemala (as well as in the rest of Latin America), and chronic and degenerative diseases are becoming more of a public health concern. Over-nutrition, and, in particular, obesity can have important negative health consequences, mainly associated with an increased prevalence of chronic diseases such as hypertension, blood lipid concentration, diabetes mellitus,[43] and ischemic heart disease.[44] Past studies have also shown the existence of an association between excess weight and endometrial cancer and between high adult BMI and mortality.[45]

[43] Type 2. non-insulin-dependent.

[44] See Solomon and Manson (1997).

[45] See Stevens et al (1998).

Children

Several studies have documented an increasing prevalence of excess weight and obesity in children in industrialized countries, but less information is available for developing countries. A recent WHO study reported that 3.3 percent of children in developing countries in 1995 were obese.[46] Although morbidity related to obesity is rare among children, there is a high risk that obesity in childhood persists into adulthood. Therefore, it is important for policymakers to monitor changes in children's obesity over time.

The prevalence of obese children in Guatemala increased from 2.7 percent to 5.4 percent between 1987 and 2000 (Table 3.1).[47] Guatemala is undergoing a rapid nutritional transition, characterized by the adoption of Western-style diets that are high in saturated fats, sugar, and refined foods, which may explain the observed increase in obesity.

Table 3.1: Trend in Obesity among Preschool Children in Guatemala

Year	Percentage of Children
1987	2.7
1995	4.0
2000	5.4

Note: Children <5
Sources: DHS (1987, 1995) World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 3.2 presents data on the prevalence of obesity among preschool children in Guatemala by age group and sex. Obesity tends to be high during the first months of birth and to stabilize after the child's second year. No significant difference in obesity rates between male and female children has been observed.

Table 3.2: Child Obesity in Guatemala by Age Group and Sex, Percentage of Children with WHZ>2

	Age Groups (in months)						
Percentage of Children<5	**0-5**	**6-11**	**12- 23**	**24- 35**	**36- 47**	**48 –60**	**Total**
Total	9.6	5.4	7.8	3.5	4.4	3.8	5.4
Male	9.6	5.2	9.4	2.5	4.1	4.0	5.5
Female	9.7	5.7	6.1	4.4	4.8	3.6	5.2

Note: Children <5
Source. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 3.3 shows that obesity tends to be higher among children living in urban areas and among non-poor and non-indigenous households. The Metropolitan region has the highest prevalence of obesity (7.8 percent). Note that the Metropolitan region also has the highest concentration of fast food restaurants.

[46] De Onis and Blossner (2000).

[47] Obesity is defined as weight-for-height greater than two standard deviations of the NHS international reference median (WHO, 1995)

Table 3.3: Child Obesity in Guatemala by Household Characteristics

Percentage of Children<5	Proportion of children with WHZ>2
Total	5.4
Quintile	
Q1	4.7
Q2	4.4
Q3	4.5
Q4	6.8
Q5	8.3
Poverty Level	
Extremely Poor	4.8
Poor	4.4
Non-poor	7.4
Area	
Urban	7.2
Rural	4.5
Region	
Metropolitan	7.8
Norte	2.9
Nororiente	4.7
Suroriente	4.9
Central	5.1
Suroccidente	5.1
Noroccidente	5.7
Peten	4.8
Ethnicity	
Indigenous	4.7
Non-indigenous	6.0

Note: Children <5
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 3.4 shows differentials in child obesity by parents' education and by consumption quintiles. Overall, the prevalence of obesity is highest among children whose parents have the highest level of education (secondary school or higher). The same pattern is also observed when controlling for households' economic status.

Table 3.4: Child Obesity in Guatemala, by Parent's Education
Percentage of Children<5

Parents' Education Level	Q1	Q2	Q3	Q4	Q5	Total
Mother						
None	4.1	4.1	3.0	5.3	7.4	4.1
Preparatory & Primary	3.0	3.3	6.8	3.5	7.2	4.6
More	n/a	14.5	4.9	10.2	13.1	11.1
Father						
None	3.5	3.7	3.1	7.7	3.9	3.8
Preparatory & Primary	3.7	3.5	4.2	3.3	7.3	3.9
More	8.0	1.0	16.0	6.1	12.5	10.3

Note: Children < 5
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala

Adults

The ENCOVI/INE 2000 is one of the few surveys that collected anthropometric data for all the individuals in the family, not only children and women. In what follows we will explore prevalence of over-nutrition and obesity among adults. A special section focuses on women in order to present an international comparison.

Women. Previous studies show that the over-nutrition problem is particularly serious for women.[48] Table 3.5 presents information from the latest available DHS surveys on excess weight and obesity among Latin American women. .

Guatemalan women have the highest prevalence of obesity in the Latin American region (16 percent) and the second highest prevalence of excess weight (32 percent) after Peru (36 percent). Moreover, both excess weight and obesity have increased in Guatemala over the last few years. In particular, obesity has almost doubled between 1995 and 2000, increasing from 8.1 percent to 16.0 percent.

[48] Martorell et al (1998).

Table 3.5: The Prevalence of Over-nutrition among Women in Latin America - Historical and International Trends

	BMI mean	Standard deviation	25.0-29.9 (Overweight)	>= 30.0 (Obese)	Number of women
Dominican Republic 1991	23.2	4.6	18.9	7.2	1990
Dominican Republic 1996	24.2	4.3	27.2	10.4	2492
Haiti 1994	21.2	3.4	9.3	2.6	1816
Guatemala 1995	**24.2**	**4.1**	**26.4**	**8.1**	**4484**
Guatemala 1999	**25.0**	**4.4**	**31.7**	**12.1**	**2199**
Guatemala 2000 *	**25.5**	**4.8**	**32.3**	**16.2**	**8208**
Nicaragua 1997	24.7	4.5	28.6	11.6	4793
Bolivia 1994	24.3	3.7	25.6	7.8	2222
Bolivia 1998	25.3	4.0	35.2	11.2	3857
Brazil 1996	24.0	4.4	25.1	9.7	2949
Colombia 1995	24.5	4.0	31.1	9.2	3156
Colombia 2000	24.7	4.0	30.3	10.5	3070
Peru 1992	24.8	3.8	30.7	8.9	4630
Peru 1996	25.1	3.8	17.1	4.5	9600
Peru 2000	25.4	3.9	35.8	11.6	8372

Note Results are based on samples; in ENCOVI 2000 women over 18, excluding outliers (bmi<=12 | bmi>=50)
Sources:DHS and ENCOVI 2000 for latest observation on Guatemala

The Whole Population. Tables 3.7 and 3.8 present data on the prevalence of adult over-nutrition by selected characteristics. On average, over-nutrition in Guatemala tends to be a more serious problem for women than for men, with 33 percent of women being overweight and 16 percent obese while the corresponding figures for men are 28 percent and 6.4 percent respectively.[49] The prevalence of obesity among Guatemalan women in 2000 was similar to the prevalence observed among US women in the same year (19.4 percent), (Table 3.6).[50] In Brazil, the only Latin American country where nationally representative survey data on obesity have been collected in the last 10 years, 6 percent of the men and 13 percent of the women were found to be obese in 1989.[51]

Table 3.6: The Prevalence of Obesity in the United States

Percentage of Individuals > 18	1991	1995	1998	1999	2000
Total	12.0	15.3	17.9	18.9	19.8
Men	11.7	15.6	17.7	19.1	20.2
Women	12.2	15.0	18.1	18.6	19.4

Source. CDC Behavioral Risk Factor Surveillance System (1999-2000).

The prevalence of adult obesity is greater in households in higher consumption quintiles, especially among men, with 43.1 percent of men in the richest consumption quintile being overweight and 12.0 percent being obese. The corresponding figures are lower among men in the poorest consumption quintile (27.6 percent and 6.4 percent respectively).

[49] According to CDC (2001) the prevalence of obesity among US adults was in 2000 19.1 percent among men and 18 percent among women. CDC also estimates that 55 percent of adults are overweight in the US. Available on the web at: http://www.cdc.gov/nccdphp/dnpa/obesity/trend/prev_char.htm

[50] CDC (2001).

[51] Monteiro et al (1995).

Table 3.7:– The Prevalence of Over-nutrition among Adults in Guatemala by Consumption Quintiles

Percentage of Individual >18	Total	Q1	Q2	Q3	Q4	Q5
Male						
Overweight	27.6	11.9	18.5	27.0	27.7	43.1
Obese	6.3	1.7	2.6	3.3	8.5	11.8
Female						
Overweight	32.3	23.3	30.0	32.1	34.8	36.7
Obese	16.2	4.2	9.3	15.0	22.4	23.1

Note: Overweight is defined for levels of BMI between 25.0 and 29.9 Obesity for BMI >= 30.0. Non-pregnant women
Source· World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

About 36 percent of non-poor adults are overweight, regardless of their sex. The prevalence is lower for poor and extremely poor men (19 percent and 11 percent respectively) while it remains very high for both poor and very poor women (29 percent and 24 percent respectively).

Table 3.8: The Prevalence of Over-nutrition among Guatemalan Adults by Poverty Status

Percentage of Individuals > 18	Total	Non-poor	Poor	Extremely Poor
Male				
Overweight	27.6	35.7	18.8	10.5
Obese	6.3	9.9	2.5	1.4
Female				
Overweight	32.3	35.2	29.0	23.6
Obese	16.2	22.4	9.4	3.5

Note: Overweight is defined for levels of BMI between 25.0 and 29 9; Obesity for BMI >= 30.0. Non pregnant women
Source. World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

There are significant differences in over-nutrition rates by area of residence and ethnicity for men. The prevalence of obesity and excess weight are much higher among men living in urban areas and in non-indigenous households than among men living in rural areas and in indigenous households. Women, on the other side, have very high rates of over-nutrition in both urban and rural areas and in both indigenous and non-indigenous households.

Table 3.9: The Prevalence of Over-nutrition among Adults by Area and Ethnicity

Percentage of Individuals > 18	Total	Urban	Rural	Indigenous	Non-indigenous
Male					
Overweight	27.6	37.0	20.9	22.5	30.9
Obese	6.3	10.4	3.4	3.8	8.0
Female					
Overweight	32.3	36.3	29.0	30.5	33.3
Obese	16.2	21.4	12.1	10.7	19.7

Note: Overweight is defined for levels of BMI between 25.0 and 29.9; Obesity for BMI >= 30.0. Non pregnant women.
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Differentials in the prevalence of excess weight and obesity by level of education are shown in Tables 3.10 and 3.11. Both women and men have higher rates of excess weight and obesity as their levels of education increase. The same pattern is observed even after controlling for economic status; in each consumption quintile, a higher level of education is associated with a higher prevalence of over-nutrition.

Table 3.10: The Prevalence of Excess Weight among Adults by Level of Education

Percentage of Individuals > 18	Total	Q1	Q2	Q3	Q4	Q5
Male						
None	18.5	11.0	17.5	20.3	21.9	34.2
Preparatory & Primary	27.3	12.5	19.8	29.9	30.4	39.4
More	38.8	21.1	13.6	31.9	26.9	46.7
Female						
None	29.9	22.5	28.9	30.0	36.9	36.3
Preparatory & Primary	32.7	25.4	32.2	30.5	32.0	39.1
More	36.6	22.6	26.2	50.8	37.4	35.1

Note: Overweight people are defined as having BMI levels between 25.0 and 29. Non-pregnant women
Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Table 3.11: The Prevalence of Obesity among Adults by Level of Education
Percentage of Individuals > 18

Education Level	Total	Q1	Q2	Q3	Q4	Q5
Male						
None	2.9	1.9	1.9	3.0	4.1	6.6
Preparatory & Primary	6.3	1.5	2.9	3.4	9.3	13.0
More	10.5	-	6.1	3.9	10.5	12.1
Female						
None	12.2	3.9	6.8	14.5	19.4	26.3
Preparatory & Primary	20.5	5.1	12.6	16.4	26.2	29.9
More	16.9	-	23.2	10.2	18.7	17.1

Note. Obesity is defined for levels of BMI >= 30.0. Non pregnant women.
Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica – Guatemala

IV: Discussion

Because of the many causal mechanisms that are involved in promoting the growth of children, chronic malnutrition is mostly mitigated by generally improving the living conditions of families. However, increasing household income is not enough to guarantee a reduction in malnutrition. Similarly, simply augmenting food production does not necessarily improve a person's nutritional status; poor health and a lack of access to basic health services could put children who have an adequate caloric intake at risk.

In countries like Guatemala, where almost half of all children are malnourished, it is vital that the government should take targeted and concerted actions in the areas of health, access to basic services, education, and specific nutritional interventions with the support of donors and the participation of civil society. These actions are needed to accelerate the decline in the prevalence of chronic malnutrition. Although it is not part of our study to analyze the government's strategy and programs addressing the different aspects of malnutrition, we can make some comments on the existing framework and recommendations for future actions. For many years, the government has tried to integrate its actions in different sectors with the aim of guaranteeing adequate amounts of food and ensuring the conditions necessary for a healthy lifestyle. However, so far, these different programs have only had a very limited effect.

Evidence shows that the following types of interventions are likely to be most successful in tackling the causes of malnutrition among Guatemalan adults and children:

- *Community-based Programs.* A lack of appropriate nutrition information and incorrect feeding practices for infants and young children are key causes of child malnutrition. A person's nutritional status improves largely due to changes in his or her behavior. Yet Guatemala has introduced very few community-based programs, which have proven to be successful in producing this change in awareness and behavior in many countries of Latin America. Analysis of different programs in other parts of the world has also shown that community-based programs are the most cost-effective interventions for child malnutrition.

- *Mothers' Nutritional Status and Child Growth Monitoring.* The government's current nutritional strategy focuses on feeding programs and school-based programs, which are not directly addressing the most vulnerable groups, in other words, children under the age of two and pregnant women.

- *Micronutrient Supplementation Programs.* Guatemala's initial commitment to micronutrient supplementation programs and the relative success of the fortification of sugar with Vitamin A show that the country is capable of addressing the problem of malnutrition among the most vulnerable groups. However, the failure of most of the other supplementation programs signals a need for proper monitoring of micro-nutritional programs and policies to bring Guatemala up to speed with international recommendations. In particular, the starting point should be the implementation of an information system to collect periodic and consistent data on micronutrient deficiency.

The following are the key groups that these programs should target:

- *Preschool Children and Pregnant Women.* Preschool children should be directly targeted, in contrast to most of the existing programs that only target children in school. Malnutrition does its greatest harm to children under 24 months old, which is the period of greatest brain development and greatest vulnerability. Children's malnutrition can be partly traced back to low birth weight (and, therefore, to maternal malnutrition). Another critical period is between 6 and 24 months when infants make the transition from being exclusively fed with breast milk (which provides all the nutrient and antibodies needed by the infant) to a diet of solid and liquid foods (often contaminated and of poor quality).

- *Household-level Programs.* Nutritional education programs are needed at the household level. By emphasizing the importance of a more balanced diet, they could address both children's under-nutrition and the increasingly worrying phenomenon of adult over-nutrition.

At the moment there is no individual to whom the President, the Congress, Ministers, or donors can turn to for authoritative advice on nutrition. This lack of leadership and vision means that there is a lack of direction and prioritization among programs and that there are significant overlaps and gaps and much inconsistency. It is necessary to address the leadership and organizational gap at the national level as soon as possible and to build into the process a system of oversight by civil society so that the overall direction, resources, and priorities do not change with each change of government.

Guatemala has the highest rate of chronic malnutrition in Latin America. Yet the government's strategic framework appears to have no guiding vision on nutrition, no clear division of labor across ministries, no adequate control of resources, and no accountability. Nor is there a mechanism for assessing how programs perform. Functional leadership is absent, and the lack of a clear vision about nutrition shared by government and stakeholders alike means that nutrition is neglected in terms of both the mobilization and the deployment of resources.

Appendix A: Indicators and Methodology

In this section we present the main indicators and the methodology used in the study.

Anthropometry

Children. In empirical studies, child health is generally represented by one of the following measures: (i) clinical measures of bodily attributes; (ii) anthropometric measures of height, weight, and body mass index; (iii) respondent-reported symptoms, mortality histories, and general health evaluation; and (iv) reports of a child's inability to undertake normal activities.[52] Measurement errors are inevitable in all kinds of measures, although they tend to be fewer in the case of the first two categories. Given the complexity and the costs associated with clinical measurements, anthropometric measures are generally preferable for evaluating health and nutritional status in empirical studies.[53]

Of all anthropometric measures, the weight-for-height, height-for-age, and weight-for-age indicators have been used most extensively.[54] Height-for-age, weight-for-height, and weight-for-age deficits are commonly interpreted as indicative of chronic, acute, and total malnutrition respectively. It is very important, however, to recognize that height and weight are measures of growth attainment rather than nutritional status *per se.*[55]

Height-for-age is an indicator of *stunting*, which represents the accumulated consequences of retarded skeletal growth and is frequently found to be associated with poor overall economic conditions. Weight-for-height is an indicator of *wasting*, a deficit in tissue and fat mass compared with the amount expected in a child of the given height. One of the main characteristics of wasting is that it can develop very rapidly, and, since under favorable conditions weight can be restored quickly, the individual can also regain the necessary weight equally rapidly. Weight-for-age is commonly interpreted as an indicator of total malnutrition or *underweight*. It has been shown that deficits in weight-for-age are a composite of deficits in weight-for-height and height-for-age and that studying weight-for-age does not add any additional information to that provided by studying the other two indicators– weight-for-height and height-for-age.[56]

Evaluating the growth attainment of a population requires a reference population that allows for normal variation within any age group. Although there are obvious differences between adults of different ethnicities, children of different ethnicities have the potential to achieve similar levels of growth in the first few years of their life. Many comparative empirical studies have demonstrated that socioeconomic factors are of greater importance than race and ethnicity in determining children's height.[57] Data from India[58] and Guatemala[59] suggest that ethnic differences in growth potential are minor prior to puberty and

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[52] Behrman and Deolalikar (1988).

[53] Martorell and Ho (1984) and Eveleth and Tanner (1990). See Thomas and Strauss (1996) for a discussion of the difficulties associated with the measurement of health status and the collection of height and weight data.

[54] See Martorell and Habicht (1986) for a comprehensive review of the main research findings on the characteristics of children's anthropometry in developing countries.

[55] Martorell (1982) and WHO Working Group (1986).

[56] Keller (1983).

[57] See Part I for a brief review of such studies.

[58] Rao and Sastry (1977).

[59] Johnston, Borden, and MacVean (1973).

that it is during this stage that the major differentiation between ethnic groups takes place. Clear differences surface during the adolescence period for both sexes; Guatemalan and Indian children who were near the 50th percentile of the reference growth charts prior to puberty, ended up near the 25th percentile by the end of adolescence.

The World Health Organization has long recommended the use of a reference population for the assessment of the nutritional status of children.[60] The International Reference Population advocated by the World Health Organization (WHO) was developed by the US Centers for Disease Control (CDC) based on data from the National Center for Health Statistics (NCHS). The reference curves were obtained from two different populations. For children below the age of two years, the sample is small and is based almost exclusively on white, middle-class children attending the FELS Research Institute in Ohio. The children's recumbent lengths were measured for the FELS data. For children aged two to adulthood, the WHO/NCHS/CDC cross-sectional curves are based on the relatively large and nationally representative sample of children obtained from the first National Health and Nutrition Examination Survey in the United States. Therefore, it also includes non-whites and children from low-income households. The children standing heights were measured for the NCHS data.[61]

In order to be able to compare the growth attainment of children of different ages by sex, we converted the ENCOVI/INE anthropometric measurements into three indexes: height-for-age, weight-for-age, and weight-for-height. Using the WHO/NCHS/CDC curves, we then expressed the growth attainment of each child as a standard deviation from the median (z-scores).[62] The standardizing calculations were made with ANTHRO (Software for Calculating Pediatric Anthropometry), Version 1.01, provided by the Division of Nutrition of the Centers for Disease Control and the Nutrition Unit of the World Health Organization.

The z-score measures the degree to which a child's measurements deviate from what is expected for that child based on a reference population. The formula for the calculation of the height-for-age z-score is:

$$z_i = (Y_i^{s,a} - H^{s,a})/\sigma^{s,a}$$

where z_i = z-score for child i; $Y_i^{s,a}$ = measured height (in cm) for child i of sex s and age a;

$H^{s,a}$ = median height (in cm) for children of sex s and age a in the reference population; and

$\sigma^{s,a}$ = standard deviation in height (in cm) for children of sex s and age a in the reference population.[63]

In the reference population, 2.3 percent of the children had a z score less than –2, and 16 percent had a score of less than –1. These levels are generally expected for a "normal" population. We then calculated malnutrition rates as the percentage of children younger than five whose z score was two standard deviations below the reference value. Children were defined as stunted if their height-for-age z score was used, as wasted if their weight-for-height score was used. and underweight if their weight-for–age score was used.

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[60] Waterlow et al (1977), WHO (1979), WHO (1983), and WHO Working Group (1986)

[61] Hamill et al (1979).

[62] Waterlow et al (1977) and WHO Working Group (1986).

[63] For example, in computing the z-score for height-for-age of a 17-month old boy, the child's height was compared to the distribution of height among 17-month old boys in the international reference population (the median and standard deviation are 81 4 cm and 3.0 cm respectively). If the index child is 76.5 cm tall, his height is 1.63 standard deviations below the median and he is assigned a z-score of –1.63.

Adults. The nutritional status of adults has been studied less intensively then that of children's, in part because of a lack of data and in part because the consequences of malnutrition for adults are considered to be less severe than for children. Moreover, since the nutritional status of adults is largely determined earlier in their lives, there is less scope for policy interventions. Also, although genetic variations in growth attainment at adult age are very important, the use of an international reference against which to measure individual growth performance is problematic. However, there are several reasons why it is highly desirable to analyze the nutritional status of adults. First, the nutritional status of women can have serious consequences for their children's birth-weights and for infant mortality. Second, some studies have shown that there are economic and health consequences to being a malnourished adult. Not only has low body mass index (BMI) been shown to have a negative effect on labor productivity but also, in developing countries, a BMI lower than 18.5 has been associated with increased mortality risk.

There is evidence that, in many developing countries and particularly in Latin America, overweight adults are more common than underweight adult. In most population, excess weight and obesity are generally associated with increase risks of morbidity, like heart disease, diabetes mellitus, and some forms of cancer.

The body mass index - weight in kilograms over height in meters squared - is the most common indicator of adult nutritional status.[64] BMI measures the thinness or obesity of adults controlling for the fact that weight is influenced by height and, therefore, is less biased by this relationship than other indexes. Moreover, by being correlated with fat mass, BMI is a good index of body energy. The WHO Expert Committee on Physical Growth suggests that a BMI of 18.5 should be seen as the minimum requirement for adequate health and proposes the classification presented in Table A.1.

Table A.1: Cutoff Points for BMI – Adults

Classification	BMI Range
Underweight	
(Chronically Energy Deficient)	
Mild	17-18.49
Moderate	16-16.99
Severe	<16
Normal	18.5-24.99
Overweight	>=25
Preobese	25-29.99
Obese Class 1	30-34.99
Obese Class 2	35-39.99
Obese Class 3	>40

Source: WHO, 1995 and 2000.

Table A.2 shows the prevalence levels of adult malnutrition and specifies which levels would indicate the existence of a public health problem.

[64] BMI is an appropriate indicator for white individuals living in Europe or North America, but its appropriateness has been questioned for other populations that differ in body build and proportions (WHO Expert Committee, 1995).

Table A.2: Prevalence Levels of Malnutrition among Adults

Population Prevalence with BMI <18.5	Classification
5-9%	Low Prevalence – warning signal, monitoring required
10-19%	Medium Prevalence – poor situation
20-39%	High Prevalence – serious situation
>40%	Very High Prevalence – critical situation

Source WHO, 1995

Micronutrients

Another important aspect of malnutrition is a lack of adequate micronutrients, in other words, those minerals and vitamins needed by the body in small amounts for different functions that are essential to healthy growth and development. Micronutrient deficiency is an important cause of poor health, learning disabilities, blindness, and premature death. Generally, micronutrient deficiencies refer to inadequate amounts of iron, vitamin A, and iodine.

Iron is essential for the production of hemoglobin, which helps to deliver oxygen from the lungs to body tissues, to transport electrons in cells, and to synthesize iron enzymes that are required to utilize oxygen for the production of cellular energy. Vitamin A is an essential micronutrient for the normal functioning of the visual system, for growth and development, and for the maintenance of epithelial cellular integrity, the immune function, and reproduction. Iodine is required for the synthesis of thyroid hormones, which are involved in regulating the metabolic activities of all cells throughout the lifecycle. In addition, it plays a key role in cell replication. This is particularly relevant for the brain since neural cells multiply mainly in utero and during the first two years of life. Data on micronutrients were not collected in the ENCOVI/INE survey, so our analysis draws on studies from INCAP and UNICEF carried out in Guatemala during the late 1990s.

Models and Methodology

During the last two decades, two major frameworks have been proposed in the social sciences to study the determinants of child health and survival. The first is the Mosley-Chen framework,[65] which has proved very useful for identifying the proximate determinants through which household and community variables operate to affect child health and survival in developing countries. The Mosley-Chen framework remains a conceptual model and does not estimate the impact of either the proximate determinants or the socioeconomic variables on child health. The second framework is the basic microeconomic model of the family,[66] which has proved very useful for guiding analysts in their choice of explanatory variables in a systematic manner and for interpreting the empirical results.[67]

It is important to distinguish between exogenous and endogenous variables when investigating the determinants of child health. Exogenous variables, such as parent's education and height, are pre-determined and have values that are not affected by the outcome of the process under examination (children's nutritional status in this case). On the other hand, endogenous variables, such as the use of medical care and breastfeeding, are under the control of the parents and have values that are determined by forces operating within the model. For example, parents are not likely to bring their children to a

[65] Mosley and Chen (1984).

[66] Becker (1981) and Singh, Squire, and Strauss (1986).

[67] Behrman and Deolalikar (1988).

medical provider unless they think their children are sick. Including endogenous variables without further control would result in biased estimated coefficients.

The Mosley-Chen Framework. In their analytical framework, Mosley and Chen identify five categories of proximate determinants of child health and survival in developing countries: (i) *maternal factors* (age at childbearing, parity, and birth intervals, which are affected by reproductive practices); (ii) *environmental contamination with infectious agents*, which is influenced by hygienic practices; (iii) *nutrient deficiency* (calories, protein, and micronutrients, which are affected by feeding practices); (iv) *injuries* (accidents and intentional injuries, which are affected by care); (v) *personal illness control* (preventive measures and curative treatment, which are affected by health care practices). The framework is very comprehensive and shows how causes of malnutrition are multi-sectoral, ranging from food intake through health care practices to economic status. All social and economic determinants must operate through the proximate determinants to affect children's health and survival.

The Economic Model of the Family. The Beckerian microeconomic model of the family provides the basic theoretical framework for a number of empirical studies of determinants of nutritional status. According to the simplified one-period model, households maximize the following utility function:

$$U = u(X, L, N)$$

where X and L represent the households' consumption of a composite good (the vector of consumption goods of different individuals in the household) and the household members' leisure respectively, and N is the nutritional status of household members. Households maximize their utility function under several constraints, including a time constraint for each household member, a budget constraint for the entire household, and a biological nutrition production function:

$$N = n(I, Z, \eta)$$

The nutrition production function n relates the nutritional status of the child (the age and sex standardized anthropometric measure, either height-for-age or weight–for-age) to his or her past health status and the proximate determinants as outlined in the Mosley-Chen framework. In this simplified one-period model, nutrition is a function of a set of inputs chosen by the household (including food intake, breastfeeding, utilization of health facilities, and the time dedicated by the mother to health-related activities), a set of exogenous characteristics (Z), which include the child's age and gender, the parents' health and education, and other household and community factors that influence a child's nutrition. η is a stochastic error term representing unobserved individual, household, and community characteristics affecting children's nutritional status.[68]

Ideally, one could estimate the effect of variables that influence directly a child's nutritional status by estimating the simultaneous system of the health production function and input demands. Unfortunately, the structure of the analysis is severely constrained by what data are available. The health production function is a complex relationship that cannot be captured easily by regression analysis based on cross-sectional survey data. It is best estimated with longitudinal data, which provide sufficient information to make it possible to make reliable judgments on the relative importance of different proximate determinants on growth attainment at the individual level.

The estimation of the health production function is further complicated by the fact that input use may be correlated with the error terms. The major source of bias arises from unobserved heterogeneity in the

[68] For more details on the formulation of the health production function, see Behrman J.R. and A.B. Deolalikar (1988).

outcomes, in other words, the use of inputs is correlated with factors unknown to the researcher. For example, parents may take a child to the hospital more often if they are aware of the child's weak physical condition. Not taking into account the child's initial health endowment would underestimate the effects of the utilization of health facilities.

Researchers have often adopted instrumental variables and fixed effects models to address this concern. Unfortunately, identifying instruments for inputs is often a difficult task. Moreover, it is almost impossible to measure all the inputs that enter into the health production function. Omitting inputs – or the quality of inputs – that are correlated with other included input (or instruments) could yield biased estimates.

Using cluster fixed-effect models, on the other side, makes it possible to control for missing variables at the cluster level (in other words, at the family/household level). The main problem in using fixed-effect models is twofold: (i) if dummy variables are included for every fixed effect (such as for every family or every cluster), computation may not be feasible(in other words, if we added one dummy for each household); and (ii) if the fixed effect is differenced away, then the effect of those variables that do not vary within a cluster (such as income in the household or infrastructure in a community) will be lost in the estimation process. Moreover, fixed effects do not work if non-linearities are omitted in the model and if the unobservable variables affecting the health production function are not fixed.[69]

Quasi-reduced Form Estimation. In the absence of adequate instrument and fixed-effect models, estimating reduced-form equations has proved to be a viable solution. Estimation of the reduced-form anthropometry function *n* does not provide information on the biological mechanisms responsible for children's growth deficits, but it does provide a consistent statistical framework within which to estimate the impact on children's health and nutrition of household and community exogenous variables that are generally open to policy intervention. The parameter estimates of the coefficients in the reduced-form equation can be interpreted as the *full* effects of exogenous covariates, that is their effects not mediated by the proximate determinants.

The microeconomic model of the family can be solved to yield a reduced-form equation for health outcomes in which child anthropometry depends only on exogenous individual, household, and community characteristics:

$$N_i = n(C_i, C_h, C_c, \varepsilon_i),$$

where N_i is the height-for-age z-score for child i;

C_i are the individual characteristics of the child, including age and sex;

C_h are household characteristics that incorporate measures of family background, including resource availability, parents' health, and parents' skills measured generally by their level of education, and whether the father is absent from the household;

C_c are community characteristics, including the availability of health services, the state of infrastructure such as water and sewage, food prices, and other community characteristics that affect child health through the proximate determinants; and

[69] Multi-level (random effects) linear models offer an alternative to fixed-effect models but do require additional assumptions about the distribution of the error terms.

ε_i is an individual specific random disturbance associated with the anthropometric outcome of the indexed child and is assumed to be uncorrelated with the C variables.

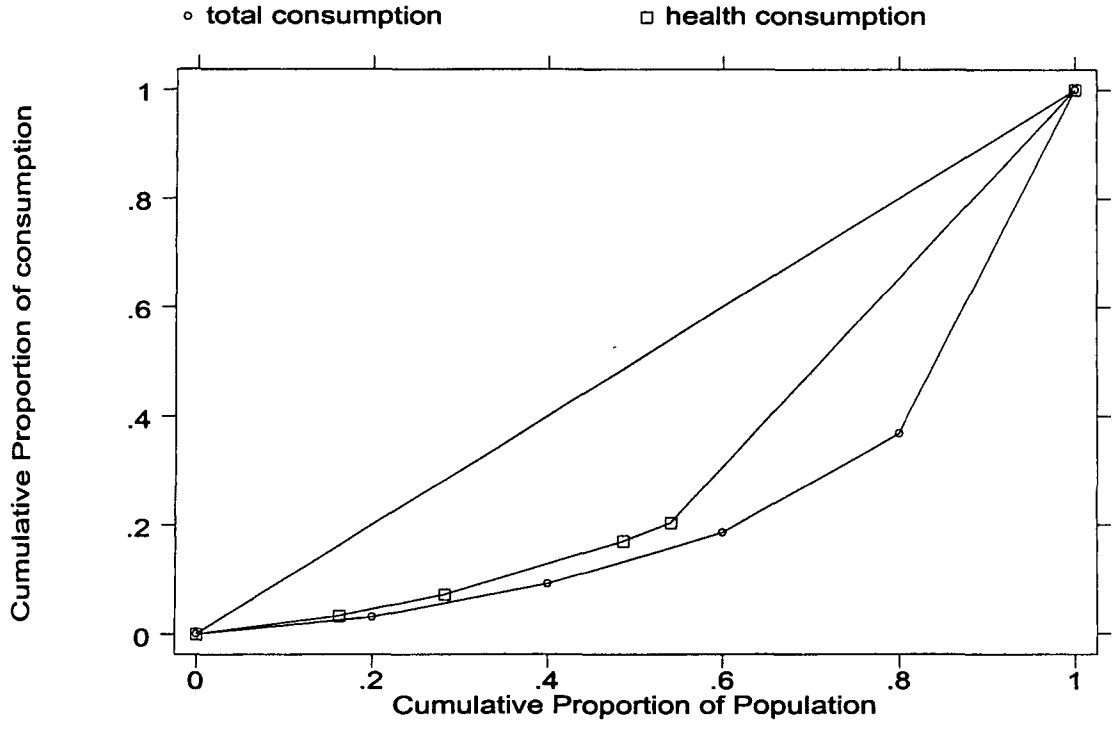
An alternative to the simple reduced-form approach is to estimate a quasi-reduced form model,[70] which differs from the standard model in that it includes some predicted inputs from the health production function (like consumption or quality of water or sanitation) and some variables from the reduced-form demand equation. Compared to the traditional reduced form, this approach has the advantage of controlling for the endogeneity bias and helping to explain the effect of some policy instruments, such as the availability of household resources. On the other hand, interpreting results from this kind of study is difficult, as they do not disclose the total effect of exogenous changes nor all of the structural parameters. In Part I, we estimated a quasi-reduced form model in which we used a household's assets, land, and non-wage income as identifying instruments for per capita household consumption.

[70] See Berman and Deolalikar (1988) and Sahn (1989).

Appendix B: Food Expenditure in Guatemala

Income and access to food are necessary but not sufficient conditions for improving nutritional status. A key factor for nutritional status is the quality of the food that individuals are eating. Individuals' diet is mainly a function of income, culture, and the availability of food in the region. Figure B1 shows the concentration curves for total per capita consumption and food per capita consumption in Guatemala.

Figure B1 -Distribution of Food Consumption in Guatemala



Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala.

Table B1 shows the absolute and relative values of food expenditures (as a percentage of total consumption) in different consumption quintiles. Wealthier people spend five times more on average on food than poorer people. However, food expenditures constitute a smaller proportion of their total consumption than in the consumption of poor people.

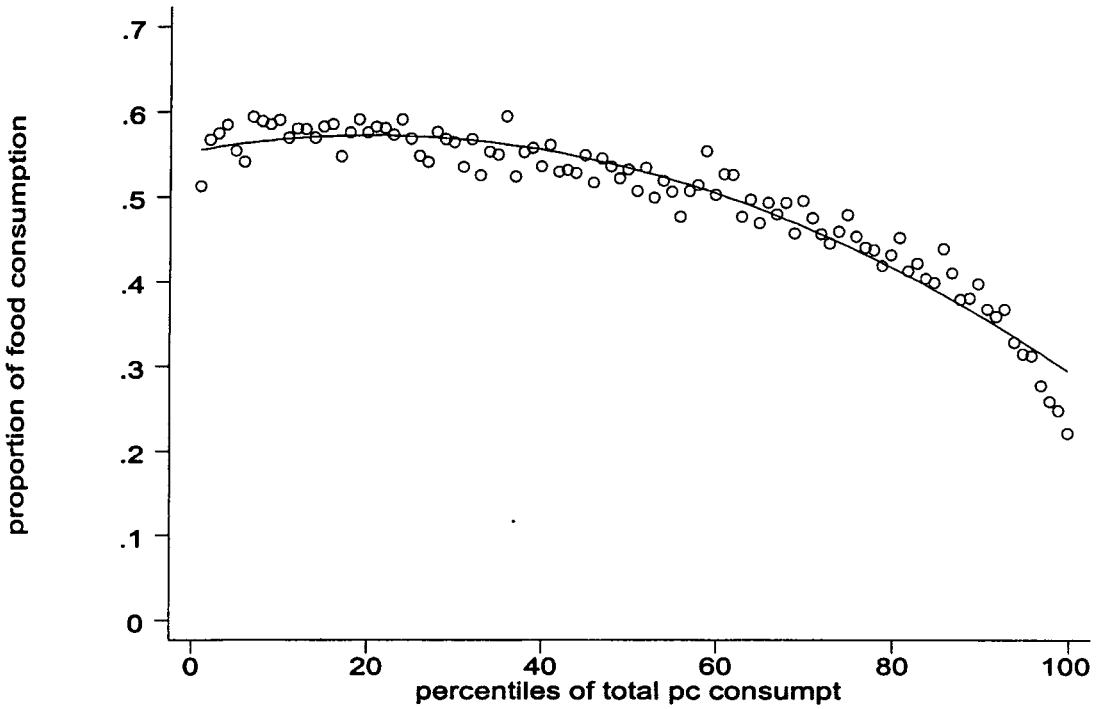
Table B1 - Food Consumption by Consumption Quintile

	Q1	Q2	Q3	Q4	Q5
Expenditure on Food (000 Qtz)	6,894	1,1628	14,772	21,343	37,974
Proportion of Total Expenditure on Food	57.0%	55.9%	52.2%	47.0%	35.7%

Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala

For very poor households, food consumption absorbs between 50 percent and 60 percent of total consumption (Figure B2). This tendency remains the same for approximately two-thirds of the national population. Only the richest 40 percent of the population spend a lower proportion of their budget on food, a sign that they have more resources available to diversify their consumption towards more luxurious goods and services.

Figure B2 -Proportion of Total Expenditure on Food by Percentile of Total Household Per Capita Expenditure



Source World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadistica - Guatemala

Food consumption plays an important role in absorbing external shocks. Faced with such shocks, families of all economic backgrounds tend to react by "doing nothing" or by sacrificing particular food items. This behavior increases the nutritional vulnerability of the poorest individuals who have fewer resources to spend on food and who tend to include the most malnourished people in society. This was also a response observed in the communities studied in the Qualitative Study of Poverty and Exclusion (QPES).[71]

[71] The QPES provides the main source of qualitative information for the GUAPA. The QPES collected data in ten rural communities that are also included in the ENCOVI. The configuration of these villages seeks to examine perceptions of poverty and exclusion for a number of ethnicities; as such, the sample includes two villages from each of the following ethnic groups: Mam, K'iche, Q'eqchi, Kaqchiqel, and Ladino (non-indigenous). For the purposes of protecting the anonymity of respondents, each village is given a code name (e.g., M1, M2, K1, K2, etc.). The field work covered a number of themes including: perceptions of poverty and welfare; perceptions of risk, shocks and vulnerability; social capital; user perceptions of public programs; community perceptions of education; and gender roles and issues. The main research instruments included: community focus groups, direct interviews, social mapping, and observation. See Annex 5 of the main report for a summary of the main findings of each of the ten QPES villages

Table B2 - Reaction to Adverse Situations

	Reaction to Adverse Situations - % of People per Each Quintile									
	General Adverse Situations					Particular Adverse Situations				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
Use savings	4	4	5	5	5	9	7	12	9	16
Pledge goods	0	0	0	0	0	0	0	0	0	0
Hypothec house	0	0	0	0	0	0	0	0	0	0
Charge insurance	1	0	0	0	0	0	0	0	0	0
Work more	12	17	15	13	16	14	16	13	15	14
Send other members of hh to work	3	3	4	3	2	4	3	4	10	3
Borrow money	2	3	3	3	1	8	7	9	8	8
Sell house	0	0	0	0	0	1	0	0	0	0
Sell other goods	3	3	2	2	1	6	4	3	3	2
Ask external help	0	0	0	0	0	0	1	1	0	0
Ask friends' help	1	0	0	0	0	3	2	1	1	0
Stop eating particular food	34	33	34	37	40	15	15	11	13	20
Do nothing	37	32	32	30	24	35	36	39	32	23
Other	2	5	4	7	9	5	7	6	10	13
TOTAL	100	100	100	100	100	100	100	100	100	100

Source: World Bank calculations using the ENCOVI 2000, Instituto Nacional de Estadística - Guatemala.

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